

JPRS-UEE-92-011  
3 November 1992



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# ***JPRS Report***

# **Science & Technology**

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***Central Eurasia:  
Electronics & Electrical Engineering***

# Science & Technology

## Central Eurasia: Electronics & Electrical Engineering

JPRS-UEE-92-011

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3 November 1992

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**Prediction of Color Photographic Image Evolution Based on Arrhenius's Equation**

927K0351A Moscow *TEKNIKA KINO 1*  
*TELEVIDENIYA* in Russian No 3 (423), Mar 92 pp 33

[Article by L.V. Reshedko, S.A. Bernvald, Novosibirsk Institute of Soviet Cooperative Trade; UDC 771.537.85:778.6].001.18+791.44.026:771.534.2].771.537.85

[Abstract] It is noted that the method based on Arrhenius's equations is still the best for predicting the color image keeping quality of moving and still photographic materials although conventional densitometric forecasts do not always reflect the real picture. Consequently, the behavior of not only densitometric but also colorimetric indicators during the storage is examined and a new attempt is made on this basis to predict the color image keeping quality. The results of the image quality preservation (i.e., useful life) on still and moving photo materials formed by various hydrophobic and hydrophilic components and comparative useful lives of color images on positive still and moving picture materials are summarized. An analysis shows that the densitometric stability is always higher than the colorimetric stability, so real forecasts should always be based only on the colorimetric preservation principle. Tables 2; references 4: 3 Russian, 1 Western.

**Analysis of Luminance-Chrominance Cross-Color Correction Methods in Color TV Systems**

927K0351B Moscow *TEKNIKA KINO 1*  
*TELEVIDENIYA* in Russian No 3 (423), Mar 92 pp 34-38

[Article by M.A. Ahmed; UDC 621.397.3:621.372.55]

[Abstract] Cross-color distortions between the luminance and chrominance signals in color TV systems appearing due to nonlinearities in the circuit, i.e., the luminance signal cross-modulation by the chrominance signal, are discussed and the characteristics of the cross-color noise development, i.e., spectral crosstalk distortions of the nonsuppressed range of the RF luminance signal in the chrominance channel due to the operating principle of the system are considered. In particular, the specific features of the NTSC, SECAM, and PAL standards are addressed and block diagrams of the filtering systems used in each standard are cited. The possibilities of reducing cross-color noise are considered and the effect of the emergence of digital TV picture processing facilities on the outlook for correction systems is examined. The need to focus future attention on developing the methods and devices for suppressing the principal TV image distortions by means of linear, nonlinear, mutual, and separate luminance and chrominance signal processing in the color TV set is stressed. Figures 4; references 17: 9 Russian, 8 Western.

**TV Polarimetry Technology**

927K0351C Moscow *TEKNIKA KINO 1*  
*TELEVIDENIYA* in Russian No 3 (423), Mar 92 pp 38-43

[Article by V.A. Selivanov, B.K. Dzhapparkulov, A.I. Tsvetkov, B.V. Tobotras, V.L. Goldenberg, Ye.N. Pestrov, Ye.V. Razbash, B.P. Khromoy, Moscow Communications Institute]

[Abstract] The shortcomings of conventional instruments which measure only the luminous field intensity distribution are mentioned and it is noted that an additional analysis of the light polarization state makes it possible to discriminate objects with an identical reflectance but different spatial orientation or distinguish matte surfaces from glossy ones, determine the direction toward an illumination source in a turbid medium, measure the aerosol composition, etc. Interest in using this approach for taking polarization measurements of both spatial and dynamic phenomena prompted the development of a device which makes it possible to observe the full range of polarization characteristics of the luminous field in a broadcast television standard; this method differs from traditional multi-channel methods by the need to construct the resulting images by a certain algorithm from the source images produced directly in the TV channel. The mathematical premises of the video polarimetry method are outlined and the outcome of experimental research is discussed. The nondimensional measurement error coefficient is plotted and a block diagram of the prototype system is cited. The images of the polarization test table produced by this method are shown. The need to search for new efficient polarization signal processing, encoding, and visualization is stressed. Figures 3; tables 1; references 9: 7 Russian, 2 Western.

**Miniature Three-Signal Vidicon With Frequency-Phase Encoding for Consumer TV Cameras**

927K0351D Moscow *TEKNIKA KINO 1*  
*TELEVIDENIYA* in Russian No 3 (423), Mar 92 pp 43-46

[Article by A.G. Lapuk, G.I. Korshunova, Z.I. Kuzminova, A.S. Markizov, L.A. Petrova, S.P. Nizhegorodov, Elektron All-Union Scientific Research Institute; UDC 621.385.832.564.4]

[Abstract] A new small three-electrode TV vidicon developed in Russia for the consumer market is described. Allowing for the need to combine a high picture quality and minimize its size, the vidicon has a tube diameter of 13.5 mm, a 95 mm maximum length, electrostatic focusing, magnetic deflection, and frequency-phase encoding which ensures the most efficient luminous flux utilization. The subcarrier frequency is 3.9 MHz and the resolution is 280 lines. The encoding light filter topology and three-electrode entrance window cross section are shown and the spectral response of the photosensitive

layer as well as the aperture characteristic are plotted. The requirements imposed on the optoelectronic system are formulated. The vidicon's energy conditions and parameters are summarized. The new vidicon makes it possible to develop a color TV camera on its basis weighing 1.3 kg (without the VCR), a power demand of 4.7 W, a signal:noise ratio of 43 dB at an illuminance of 1,400 lx, and a minimum object illuminance of 7-10 lx at a 1:1.4 lens aperture. Figures 4; tables 2; references 3: 2 Russian, 1 Western.

### Electronic Equipment Module Design With Horizontal Printed Board Positioning

927K0351E Moscow *TEKNIKA KINO I TELEVIDENIYA* in Russian No 3 (423), Mar 92 pp 61-63

[Article by N.V. Smirnov, Special Design Office of the Radiy Production Association; UDC 621.3.049.75]

[Abstract] The need for an electronic equipment (REA) module which would be consistent with the existing base rack design and have self-contained power supply and cooling system as well as be compact and suitable for using 240 x 380 mm printed boards with an up to 30 W power dissipation prompted the development of a module with a horizontal printed board arrangement which meets the above requirements. Forced cooling is provided by an air flow created due to the rarefaction formed by a fan; the air enters through a small hole and is accelerated and distributed throughout the module. A schematic diagram of the electronic module is cited. The cooling system can be used with modules having connector assemblies on the either the smaller or larger side. Figures 1; references 1.

### Automation of Acoustic Research

927K0350A Moscow *TEKNIKA KINO I TELEVIDENIYA* in Russian No 2 (422), Feb 92 pp 41-45

[Article by Yu.A. Indlin, All-Union Scientific Research Cinema and Photography Institute]

[Abstract] The proliferation of microcomputers and the availability of ready software packages provide an indispensable tool to researcher; one man now can do the work of the mathematician, programmer, and technician in addition to his main research task. One such routine—the AcMod—developed at the All-Union Scientific Research Cinema and Photography Institute (NIKFI) for the purpose of acoustic research is described. The task of plotting the amplitude and time patterns of acoustic

wave propagation at a given point in the room is considered and three solution methods—ray tracing, virtual sources, or the combination of the two—are examined. The advantages of the AcMod CAD routine in solving the wave acoustics problems are discussed and an algorithm of the AcMod routine is cited. The comparative advantages of the AcMod routine over such CAD programs as AcoustCAD by Mark IV (USA-Japan) and EASE (Germany) are discussed. The use of the AcMOD routine makes it possible to minimize possible errors in architectural acoustic designs of buildings and rooms. Figures 1; references 10: 4 Russian, 6 Western.

### Friction Properties and Reliability of Magnetic Tapes

927K0350B Moscow *TEKNIKA KINO I TELEVIDENIYA* in Russian No 2 (422), Feb 92 pp 45-48

[Article by O.A. Berkh, S.R. Nemtsova, P.P. Olefirenko, Ye.P. Trifonova, All-Union Scientific Research Institute of Television and Radio Broadcasting; UDC 621.397.454+681.84.083.84]

[Abstract] A trend toward improving the magnetic tape (ML) reliability is noted and reliability is defined as meeting the requisite requirements of magnetic tape wear resistance, recording, ability to damage magnetic heads, and durability. The friction properties of a number of magnetic tapes for audio and video recording as a function of tension, the number of runs, and aging are examined in order to estimate the magnetic tape reliability since the tape friction properties change during the tape transport as a result of strain in either of both layers and mechanical and chemical reactions in the friction zone. The factors affecting the friction properties are discussed and the friction coefficient is measured using a special IEC approved unit with a 10 percent error. The magnetic layer friction coefficient dynamics of an audio recording, i.e., its dependence on the number of passes, the friction coefficient dynamics of an audio recording before and after aging, and the dependence of the friction coefficient of both layers on the tape speed are plotted. The tape friction coefficient dynamics during the tape operation and storage reflect the layer material stability. The plots can be used for estimating the tape stability; in so doing, however, one should keep in mind the errors which depend on the rate of relaxation processes in the material, so it is expedient to measure the parameters using tape reels, rather than loops. Moreover, turn-to-turn friction does not fully determine the tape winding properties; the elastoplastic properties of tapes play a dominant role. Figures 4; tables 3; references 11: 3 Russian, 8 Western.

**Color TV Cameras' Color Transmission Rendition Optimization**

927K0350C Moscow *TEKHNICA KINO I*  
*TELEVIDENIYA* in Russian No 2 (422), Feb 92  
pp 50-52

[Article by A.Yu. Sladkov, St. Petersburg Electrical Engineering Institute]

[Abstract] The importance of improving the color rendition of color TV cameras for the development of high-definition TV systems prompted attempts to optimize color rendition—attain the through system characteristics from light to light—and ensure colorimetric fidelity of the transmitted images. Known methods of finding the coefficients of color correction matrices are reviewed and the problem of plotting an optimum color correction matrix is reduced to searching for a linear transform which ensures the best approximation of the resulting device form to ideal mixing curves of the reproducing device; to this end, the curve proximity criteria are defined and the colorimetric mixing curves of a color TV set, spectral sensitivity response of the TV camera's chroma channels, the system of orthonormalized functions derived on the basis of the system of the above spectral responses, and the resulting through TV camera characteristics produced by means of matrix color correction are plotted. The proposed color correction matrix algorithm ensures the best approximation of the spectral sensitivity response of the camera to ideal color mixing curves in the sense of the square law metric and does call for using numerical optimization methods of test colors. Figures 4; references 5.

**'Atoll' Video Information Complex**

927K0350D Moscow *TEKHNICA KINO I*  
*TELEVIDENIYA* in Russian No 2 (422), Feb 92  
pp 52-55

[Article by A.M. Skrylnikov, M.P. Akimochkin, A.V. Vilms, V.G. Melnikov, Scientific Research Institute of Electronic Materials]

[Abstract] The shortcomings of well-known compact disc video systems operating in the interactive mode (e.g., Laservision VP705 by Philips as well as Pioneer, and Magnavox) whereby the studio-recorded CDs limit the subject range of programs prompted the development of a color-coded TV slide system using regular black-and-white film and a Rastr slide projector. The system developed at the Polimer Scientific Production Association (Vladikavkaz) makes it possible to view a slide stack with a given exposure time for each slide of select any given slide by entering its number from the keyboard. The system is also capable of classifying the slides by the illuminating source luminance and maintaining a slide directory. A block diagram of the system is cited; its principal element is a BK-0010 microcomputer with a cassette-tape external memory and a Rastr slide projector with a 24-slide stack. Each slide entered from the keyboard is displayed on TV screen together with the text data from the slide directory. The operating procedure is described. Commercial production of the system with an 80-slide stack began in 1991. The system can be used for educational, law enforcement, medical, engineering, and entertainment purposes. Figures 4; references 4.



**Passive Methods for Locating Lightning. (Review)**

927K0365A Moscow *RADIOTEKHNIKA I  
ELEKTRONIKA in Russian Vol 37, No 7, Jul 92*  
pp 1153-1167

[Article by; I. I. Kononov, I. A. Petrenko; UDC  
551.594.221]

[Abstract] A review is made of methods and devices used for determining the location of thunderstorms. There are multiple-station systems operating in the SLW, and high accuracy systems operating in the ultra-short wave range. Single-station systems for finding bearing and range to the lightning are also used. In the former USSR, the multiple-station systems were used mainly for research purposes, and never gained practical application because of absence of readily accessible communication facilities. A comparative analysis is made of methods used for locating lightning from several space distributed stations and estimates are made of the errors and other factors affecting the measurement accuracy. It is pointed out that for the multiple-station application, the bearing-finding systems for locating the lightning discharges are now the most popular. This is primarily because of their acceptable accuracy, simple construction, and less rigid requirements for the information transmitting lines. The bearing and range finding systems are the only systems used with the single stations for locating the lightning, that can be mounted on board of an aircraft. Among them, the frame type bearing-finders are more compact and simple. Despite polarization errors, inherent with this type instruments, their measurement errors are, as a rule, not greater than of other single station range-finders. Figure 2, references 48: 26 Russian, 22 Western.

**Attenuation and Scattering by Rain of Circularly Polarized Short Waves in the mm Range**

927K0365B Moscow *RADIOTEKHNIKA I  
ELEKTRONIKA in Russian Vol 37, No 7, Jul 92*  
pp 1168-1171

[Article by; G. A. Andreyev, G. I. Khokhlov; UDC  
621.391.81:621.371.029.65]

[Abstract] With propagation of the mm waves in the atmosphere, their attenuation increases because of absorption and scattering by rain. Data are needed on the mm waves' attenuation and scattering as a function of the rain intensity. An experimental study was conducted with an objective to measure, under natural rain conditions, the linear attenuation, specific effective scattering area, time-autocorrelation coefficient of back scattered short mm signals with circular polarization, and to compare the experimental data with the theoretical estimates. In order to estimate the compensating energy reserve of radio systems, experimental relationships were obtained on attenuation and back scattering of a circularly polarized wave by rain with intensities of up to 10 mm/h. A receive-transmit equipment with circular polarization of radiation operating at 135 kHz and with

a 140 dB energy potential was used in the field experiments. The experimental data of linear attenuation are shown in a graph; they are in a good agreement with the theoretical. Figure 3, references 13: 8 Russian, 5 Western.

**Methods for Estimating the Probability of Radio Waves Attenuation Over Terrestrial Paths Due to Abnormalities of the Air Refraction Index**

927K0365C Moscow *RADIOTEKHNIKA I  
ELEKTRONIKA in Russian Vol 37, No 7, Jul 92*  
pp 1172-1179

[Article by; V. N. Pozhidayev, V. Svyatogor; UDC  
621.371.3]

[Abstract] One or several stable trajectories of radio waves propagation between two antenna may exist in the atmosphere under normal conditions. These are the line-of-sight trajectories and trajectories produced by the radio waves' reflection from the Earth surface. Atmospheric conditions may exist causing changes in these trajectories and signal fading in the receiving antenna. Familiar methods were analyzed for estimating the distribution probability of radio waves' attenuation over terrestrial paths due to different type abnormalities of the air refraction index in the near-ground layer, and, based on the results of experimental works, algorithms were developed for computation of the overall distributions. The effects of signal attenuation caused by a large positive gradient of the air refraction index, or by changes in refraction, were examined along with the effects caused by the radio waves reflection from the "wall" of the near-ground waveguide. Figure 2, table 1, references 8: 4 Russian, 4 Western.

**Electromagnetic Pulse Diffraction by a Long Slot on a Screen of Finite Thickness**

927K0365D Moscow *RADIOTEKHNIKA I  
ELEKTRONIKA in Russian Vol 37, No 7, Jul 92*  
pp 1189-1193

[Article by; Ye. A. Galstyan, O. V. Gornostayeva; UDC  
538.562]

[Abstract] The difficulty of the pulse diffraction problem is related to the necessity of obtaining a solution with the required accuracy of results in a wide range of frequencies that form the pulse spectrum. Solution of the diffraction problem of a monochromatic wave by a long slot on a finite thickness screen which was obtained earlier by the authors, satisfies this requirement. Based on an exact electrodynamic formulation, the problem of the electromagnetic pulse diffraction by a long slot on a perfectly conducting screen of a finite thickness is solved, by applying the results of this work and the Fourier transform. Solution of the pulse diffraction problem by the above structure using the Fourier transform, reduces to the solution of a plane wave diffraction by the same structure. Computations of the pulsed electromagnetic



field, penetrated through the slot, were carried out by a numerical integration of the developed equation, after replacing the infinite limits by the finite, depending on the spectrum length of the examined pulse. Figures 3, references 8: 3 Russian, 5 Western.

**Computation of Characteristics of a Periodic Waveguide-Rod Array, Excited by TM-Waves**

927K0365E Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 37, No 7, Jul 92 pp 1212-1219

[Article by; S. P. Skobelev, L. L. Mukhamedov; UDC 621.396.677]

[Abstract] Diffraction of TM-waves by a periodic array of planar waveguides with dielectric inserts and protruding smooth dielectric rods is examined. Waveguide-rod antenna arrays are widely used in antenna technology. An algorithm was developed for the solution of the problem based on a combination of the auxiliary source method and the method of integral equation with respect to the field in the waveguide aperture. The proposed generalized approach to computations of the characteristics of one-dimensional, waveguide-rod type periodic arrays can be used to develop simple and effective algorithms. The characteristics of these arrays may greatly depend on the configuration of the rods. In some cases more optimal characteristics can be obtained by a judicious selection of the rod configuration, than with arrays made of open-ended waveguides. This approach can also be extended to the case of two-dimensional periodic arrays of round waveguides with an axisymmetric rod of a variable cross section. Figures 4, references 13: 11 Russian, 2 Western.

**Gyroton: Modification of Amplifiers and Oscillators**

927K0365F Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 37, No 7, Jul 92 pp 1248-1252

[Article by; T. F. Dikun, A. A. Kurayev, B. M. Paramonov, A. K. Sinitsin; UDC 621.385.01]

[Abstract] Gyroton is an amplifier or an oscillator where the initial rectilinear relativistic electron flow (REF) acquires a circular sweep in the rotating fields  $H_{1in}$ ,  $T_{00n}$ ,  $E_{1in}$ ,  $E_{10}$ , or their combination at the non-synchronous level of the longitudinal magnetostatic field. Thereafter, the REF pitch-factor  $q=v_z/v_z$  (where  $v_z$  is the transverse

velocity of the electrons' rotation,  $v_z$  is the longitudinal) is increased. Some circuit solutions are discussed here, which will make it possible to increase the value of the pitch-factor  $q$  in the conversion region of the  $v_z$  into  $v_z$ . Circuits of continuous (one-cascade) gyroton-generators are also examined. Figures 4, references 11 Russian.

**Theory of Stationary Two-Dimensional Electron Beams**

927K0365G Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 37, No 7, Jul 92 pp 1267-1273

[Article by; A. V. Malykhin; UDC 537.533.2.01]

[Abstract] A new type of equations belonging to the Cauchy-Kovalevskiy type is derived for two-dimensional relativistic beams. It is demonstrated that for analytic initial conditions, the obtained equations can be applied for construction of a randomly shaped surface. Solutions, describing particle motion in a non-uniform field, taking into account the magnetic eigenfield of the beam, are derived for most common (strip-type and axisymmetric) beams. References 7 Russian.

**Absolute Biphoton Meter of Quantum Efficiency of Photoelectron Multipliers**

927K0365H Moscow *RADIOTEKHNIKA I ELEKTRONIKA* in Russian Vol 37, No 7, Jul 92 pp 1336-1338

[Article by; V. M. Ginsburg, N. G. Keratishvili, Ye. L. Korzhenevich, G. V. Lunev, V. I. Sapritskiy; UDC 621.383.3]

[Abstract] The spontaneous parametric down conversion (PDC) effect is employed with the absolute biphoton meter of quantum efficiency of photoelectron multipliers. The PDC effect is produced when a non-linear crystal is irradiated by coherent pumping, for example, by an ultraviolet laser. Based on the PDC, several new methods were proposed earlier and experimentally tested for solution of metrological problems. A circuit is examined of a modified version of the meter, assembled on a plate of vibration protected holographic device UIG-2M. Here, an axion, which focuses the conical spectrum into a linear, oriented along the optical axis, is used in place of a lens, which focuses the conical spectrum into a circular. Application of the axion significantly simplifies the meter's operation, and reduces the required pumping power, due to a more efficient utilization of the examined radiation flow. Figures 2, references 8 Russian.

### Reliability Design of Computer-Aided Process Control Systems and Its Software

927K0336A Moscow *PRIBORY I SISTEMY UPRAVLENIYA* in Russian No 3, Mar 92 pp 1-3

[Article by Yu.G. Zarenin, Kiev Automation Institute; UDC 658.51.011.56:[62-192].001]

[Abstract] The task of ensuring the requisite reliability level of an automatic process control system (ASUTP) under design and the related problems of selecting the reliability indicator makeup and assessing the actual level of system reliability under normal operating conditions, i.e., the process of reliability design, is discussed and an attempt to develop a general methodology of formulating and solving these problems made at the Kiev Automation Institute (KIA) together with a number of other institutions is reported. The resulting methodology is reflected in a number of interbranch, state, and industry-wide regulatory documents, specifications, and standards (NTMD). The general requirements imposed on the automatic process control system reliability design software (PO), the specific features of the reliability design system hardware, and software for solving the reliability design problem on a control computer, e.g., YeS 1033, 1045, 1046, 1060, etc., with a version 6.1 or higher operating system (OS) are summarized. In particular, the computer-aided reliability design system (SANA) developed at the Kiev Automation Institute for control computers using the PL/I language is described. Application software packages (PPP) developed for solving typical problem on a microcomputer are discussed. The hardware and software developed for solving reliability design problems may also be used efficiently in developing or designing other complex multielement and multifunction engineering systems.

### Test Converters of Mean Alternating Voltage Value for Generating Transducers

927K0336B Moscow *PRIBORY I SISTEMY UPRAVLENIYA* in Russian No 3, Mar 92 pp 16-17

[Article by K.L. Kulikovskiy, E.M. Bromberg, K.M. Mamedov, Baku; UDC 621.314.1]

[Abstract] The design principles of self-generating transducers used for measuring the process parameters which are important for the task of process automation are discussed and attention is focused on one crucial component element—the alternating voltage parameter converter (PPPN) which serves for converting the peak, mean, and effective voltage into an output signal. A block diagram of a full-wave rectifier for converting the alternating voltage with automatic correction of the errors caused by the rectifying element characteristics is cited and formulae are derived for calculating the mean voltage. The design compensates for the effect of the diode nonlinearity on the conversion accuracy and makes it possible to operate at signal levels below the sensitivity threshold of conventional circuits. It is suggested that a three-cycle circuit be used to compensate

for the integrator's autocorrelated error and the circuit operation algorithm is presented. The converter built on the basis of the above principles makes it possible to attain a resulting conversion error of 0.25 percent within the entire ambient temperature range. Figures 1; references 4.

### Infrared Moisture Meter With Microprocessor System

927K0336C Moscow *PRIBORY I SISTEMY UPRAVLENIYA* in Russian No 3, Mar 92 pp 21-23

[Article by L.V. Bagdasaryan, S.N. Sugak, A.V. Sidenko, O.I. Moskalenko, Food Processing Automation Scientific Production Association; UDC 621.317.3:632.123]

[Abstract] The importance of on-line moisture and humidity measurement and control for ensuring the quality of processed foods is stressed and the shortcomings of existing lab methods are noted. It is speculated that a moisture and humidity measurement method based on infrared spectroscopy makes it possible to shorten and streamline the analysis and increase the number of analyses. A block diagram of an infrared three-channel moisture meter is cited and an algorithm is proposed for eliminating the effect of the errors caused by a change in the intelligence signal parameters during the measurements taken by this device. The algorithm is developed on the basis of the pattern recognition theory. The moisture meter illuminates food by a beam from a KGM 6.3-15 halogen lamp and performs spectral analyses of the diffuse reflected light in three optical channels. The effect of instrumental errors on the measurement confidence is eliminated by determining the numerical equivalents of the spectral reflectance of fat, moisture, and reference position which depend on the instrumental error and averaging and calibrating the measurement results. The algorithms and their realization make it possible to improve significantly the moisture meter's metrological characteristics and move closer to attaining universal calibration for each specific product. Figures 1; references 1.

### On Method of Improving Magnetic-Suspension Liquid Density Meters

927K0336D Moscow *PRIBORY I SISTEMY UPRAVLENIYA* in Russian No 3, Mar 92 p 24

[Article by G.A. Nosov, Pilot Design Office at the Khimavtomatika Scientific Production Association, Redkino; UDC 681.586:532.14]

[Abstract] The low measurement accuracy on the order of  $10^{-2}$  g/cm<sup>3</sup> of conventional magnetic suspension density meters due to mechanical friction between the float and the vessel wall resulting from the attraction of the permanent magnet located in the float to the inner surface of the power solenoid and the shortcomings of the friction equalization method based on magnetic or

electromagnetic float centering prompted an examination of a method of mechanically aligning the float in such density meters. It is suggested that centering supports be positioned on the float extensions which are coaxial with the vessel housing and that vibrators capable of transferring vibrations to the vessel walls be installed at these supports. This method has been used successfully by the Pilot Design Office at the Khimavtomatika Scientific Production Association in Redkino, Tver oblast for developing a density meter with a 0.7-1.6 g/cm<sup>3</sup> measurement range for liquids with an up to 20 centipoise viscosity. A schematic diagram of the density meter and its specifications are cited and its operating principle is described. The use of the new float alignment method makes it possible to decrease the measurement error by an order of magnitude. Figures 1; tables 1.

#### Microprocessor-Based Moving-Coil Instrument

927K0336E Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 p 29

[Article by V.K. Novikov, V.V. Moiseyenko, V.V. Krokhin, S.V. Lazutkin, All-Union Scientific Research and Design Technology Institute of Electric Machine Building, Vladimir; UDC 621.317.44]

[Abstract] A microprocessor-controlled moving-coil tester intended for measuring the specific magnetization reversal power as well as the peak values of magnetic induction and field strength at a sinusoidal magnetic flux density variation is described and its specifications are listed. The instrument is used for testing individual sheets, strips, and rings of electrical-sheet steel and consists of a K1816VYe35 microprocessor, a master oscillator, a magnetization amplifier, two instrument channels, and a display unit. It can be used in the magnetic induction and field measurement mode or calibration mode and is equipped with a Centronix port, making it possible to connect it to a computer. Series K544, K555, K580, K1100, K1108, and K1133 integrated circuits are used in the microprocessor. The tester's nonlinear distortion factor is less than 2 percent and its fundamental measurement error is less than 0.5 percent. The measurement range is 0.08-5.12 A and 3.75-60 W. Figures 1; tables 1; references 1.

#### U2VF1891 Correlator

927K0336F Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 pp 31-32

[Article by V.S. Gerbylev, V.I. Zhuravlev, All-Union Scientific Research Instrument of Electrical Instruments, Leningrad; UDC 681.5.015.75:621.3.049.776]

[Abstract] The U2FV1891 correlator—a hybrid integrated circuit assembly developed at the All-Union Scientific Research Instrument of Electrical Instruments, Leningrad, under contract to the Scientific Technical Association of the USSR Academy of Sciences—in order to replace a set of series K1801 integrated circuits is

described. The correlator is intended for performing the basic functions used in computing the sampled value of the correlation function of input signals. The correlator function is derived and its circuit diagram and specifications are cited. The correlator must be used with a microprocessor or another external control system. It can be used in radar and communications systems for signal detection through noise, measuring the signal propagation time, and location and ranging; in industrial production for checking the uniformity of items; and in biology and medicine. The correlator is being produced by the Mikropribor Production Association in Lvov. Figures 1; tables 3.

#### Microprocessor System Monitoring and Diagnostic Device

927K0336G Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 p 36

[Article by S.A. Gorlov, V.N. Pyatkovskiy, Yu.A. Silayev, Special Computer-Aided Control System Design Office at Chermetavtomatika Scientific Production Association, Lipetsk; UDC 681.325.5-181.4]

[Abstract] The need to locate faults in the case of system failures and automatically switch facilities to a backup unit in microprocessor-controlled ferrous metallurgy installations prompted the development of a device capable of monitoring and diagnosing the microprocessor systems. The device monitors the microprocessor system routines from the address, data, and control busses and generates the necessary output signals. A block diagram of the monitoring and diagnostic system is cited. The device has been tested in the development of the KKTs-1 oxygen converter plant automated process control system at the Novolipetsk Integrated Iron and Steel Works imeni Yu.V. Andropov and has performed well. Figures 1.

#### On Method of Automating Diagnostics of Counters With Fixed Frequency Outputs

927K0336H Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 p 37

[Article by F.D. Dzhafarov, G.A. Kuliyeu, F.G. Pashayev, Neftegazavtomatika Scientific Production Association, Sumgait; UDC 681.398+681.519.54]

[Abstract] The difficulty and time of adjusting, tuning, and diagnosing functional modules which generate a train of fixed-frequency square pulses with an identical mark and space duration on the output contacts regardless of their initial state prompted efforts to automate the diagnostic procedure and reduce the time outlays. A new method of diagnosing binary counters—the principal component of such modules—is described and the counter functioning law is derived. A timing chart characterizing the counter operation is cited and it is noted that the counter checking procedure consists of two phases: checking the transition from spaces to marks and

checking the mark and space duration for each counter digit. The proposed method (suitable at pulse repetition frequencies of 144-0.000625 Hz) of binary counter checking is implemented in a system for the incoming and acceptance control of functional microcomputer modules and submodules. Figures 1; references 1.

#### **M2YeNE0581 Multichannel Secondary Power Supply Source**

927K03361 Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 pp 40-41

[Article by V.V. Tatsenko, Yu.N. Kuznetsov, Electric Instrument Scientific Production Association, Yaroslavl; UDC 621.311.6]

[Abstract] The M2YeNE0581 multichannel secondary power supply source developed at the Electric Instrument Scientific Production Association in Yaroslavl and mass produced at its Progress pilot plant is intended for use with a resistance thermal converter with a unified output signal. Together with an external transformer and a filtering capacitor, the power supply source makes it possible to generate eight output voltages over four channels with galvanic isolation from each other and the input power supply voltage and has an additional current output. A block diagram, connection diagram, and circuit diagrams of component units of the The M2YeNE0581 multichannel secondary power supply source are cited and its operating principle is outlined in detail. Multifunction reference elements are used to improve the power supply source performance. The M2YeNE0581 multichannel secondary power supply source specifications are summarized. The unregulated voltage magnitudes are errors are determined by the power supply voltage and the transformer. The principal element of the power supply source is executed using thin film hybrid IC technology and is encased in a

1210.28-2 glass housing. The device has an operating temperature range from -10 to +55°C at a 98 percent relative humidity and an output current of 70  $\mu$ A. Figures 3; tables 1; references 7.

#### **Device for Converting High-Rate Streams With String Structure**

927K0336J Moscow PRIBORY I SISTEMY  
UPRAVLENIYA in Russian No 3, Mar 92 pp 34-35

[Article by Yu.S. Klushin, I.P. Paralyukh, ELVIT Scientific Research and Design Institute at the Integration Training Scientific Production Association, Lvov; UDC 519.6.519.95]

[Abstract] The need to improve remote sensing facilities by improving their capabilities and resolution, using new data transmission and processing methods, and operating data processing systems in real time (RMV) prompted the development of a device for processing high-rate streams of video data with a string structure. The device is a part of the PS-2000 computer-based system with operates together with a dedicated data I/O and structure conversion processor-channel (KPVV). The use of the KPVV system makes it possible to process an information stream with a string structure at an up to 4 Mbyte/s rate in real time. A KPVV input device which performs primary processing of the input stream is described in detail; as a result of this processing, the stream is converted into strings with an identical structure thus maximizing the single-instruction-multiple-data (OKMD) PS-2000 computer utilization efficiency. The input data stream and string structure are considered and a block diagram of the KPVV input device is cited. The device uses 10 memory modules and may function with a single RAM module in which case only one data string, i.e., spectral information from a multispectral scanner, is processed at a time. Figures 2; references 3.



### Discretized Self-Wave Media and Their Possible Applications

927K0338A Moscow MIKROELEKTRONIKA  
in Russian Vol 21 No 2, Mar-Apr 92 pp 3-20

[Article by Yu.I. Balkarey, M.I. Yelinson, Radio Engineering and Electronics Institute at Russia's Academy of Sciences; UDC 539.293:534]

[Abstract] The properties of nonlinear active continual self-excited wave media (ACS) in which the propagating excitation is determined by whether the activating (a) or inhibiting (i) bonds are dominant, are discussed and the issues of discrete microelectronic realization of self-excited media and the possibility of using them for image processing and for developing associative memory systems are addressed. From the viewpoint of data processing applications, attention is focused on continual self-wave systems where continuously distributed active elements are linked by diffusion processes and cause stable collective excitations in the form of soliton pulses and stationary solitary strata as well as flip-flop waves and self-excited conditions. The analysis is limited to simple discretized self-wave media, i.e., digital media (TsDS) based on a cell containing an electronic nonlinear element. The base TsDS cells and the connectivity control in continual AVSs are examined and the following specific TsDS applications are considered: image contrast enhancement, contour enhancement, reconstruction of spatially connected images, controlled active delay lines, image shifting and freeze-framing, image recording into pulse-time codes and vice versa, selective optical memory, image correlation, and associative memory and self-wave holography. The use of TsDSs for developing artificial neuron networks and the issues of TsDS technology are investigated. It is shown that the real outlook for using self-wave systems depends on a transition from continua to discrete media. Figures 10; tables 1; references 34: 32 Russian, 2 Western.

### New Capabilities of CMOS Integrated Circuit Electronic Base at Cryogenic Temperatures

927K0338B Moscow MIKROELEKTRONIKA  
in Russian Vol 21 No 2, Mar-Apr 92 pp 21-25

[Article by V.A. Gergel, G.I. Oreshkin, N.S. Samsonov, Scientific Research Institute of Physical Problems imeni F.V. Lukin; UDC 621.382]

[Abstract] The effect of temperature on the digital integrated circuit performance is discussed and it is shown that CMOS (KMOP) device work 1.5-2 times faster when the operating temperature is lowered from 300 to 77K due to an increase in the carrier mobility. For illustration, a D-flip-flop executed with CMOS transistors and a dynamic RAM cell are considered. The temperature dependence of the memory access time and

CMOS inverter delay and the temperature dependence of the maximum data storage duration in a dynamic RAM (OZU) cell without regeneration are plotted. An analysis of the findings indicates that the use of cryogenic temperatures for enhancing the CMOS transistor operation also makes it possible to increase the possible scale of integration of VLSI circuits (SBIS) whereby the fourfold response time gain is higher than the gain resulting solely from an increased carrier mobility or an increase in the saturation rate. Moreover, the ability of long-term charge storage at cryogenic temperatures opens up new possibilities for the development of RAM circuitry and increasing the information capacity of RAM chips. Figures 5; references 10: 5 Russian, 5 Western.

### Radiation Effects in Short-Channel MOSFET Devices

927K0338C Moscow MIKROELEKTRONIKA  
in Russian Vol 21 No 2, Mar-Apr 92 pp 34-41

[Article by M.N. Levin, S.G. Kadmenskiy, A.V. Tatarintsev, V.I. Litmanovich, V.Ye. Chernyshev, Voronezh State University; UDC 571.1:539.1.047:621.382]

[Abstract] The development of surface states (PS) on the semiconductor/insulator interface and a charge in the gate insulator of the MOSFET (MDP) transistor under the effect of ionizing radiation (II) and the resulting phenomena are discussed and the effect of ionizing radiation on the parameters of short-channel MOSFET devices are investigated. In addition, a procedure is proposed for determining the radiation-induced charge in the MOSFET gate insulator with a short channel and measuring the surface state density on the semiconductor/insulator interface. To this end, *n*- and *p*-channel test transistors and CMOS elements of commercial MOSFET VLSI with  $<4 \mu\text{m}$  channel, a 45-120 nm  $\text{SiO}_2$  gate layer, and a  $5 \times 10^{14}$  to  $3 \times 10^{16} \text{ cm}^{-3}$  dopant concentration are irradiated with X-ray quanta at a 25 keV energy and a  $\leq 10^7$  rad dose in an IRIS-M3 unit and with 10-40 keV electrons in a REM-200 scanning electron microscope. The results are assessed by the voltage-current characteristic (VAKh), including the sub-threshold current area. The measurements are taken in an automated device based on an Elektronika 90 computer. An analysis shows that the presence of surface states enhances the impact of the drain potential on the threshold voltage in short-channel MOSFETs due to the two-dimensional surface state charge effect while an elevated surface states density near the drain leads to a drop in the punchthrough voltage, an appearance of a leakage current, a radiation-induced breakdown, and the appearance of a "trigger" in CMOS devices which may lead to their degradation. Figures 6; references 10: 1 Russian, 9 Western.



**Effect of  $\gamma$ -Irradiation on Magnetic Bubble IC Performance**

927K0338D Moscow MIKROELEKTRONIKA  
in Russian Vol 21 No 2, Mar-Apr 92 pp 102-104

[Article by A. Vasidov, K.M. Mukimov, R. Alimov, V.D. Khodzhaev, Tashkent State University and Scientific Research Institute of Applied Physics; UDC 541.12.011.2:539.12.04]

[Abstract] The use of magnetic bubble (TsMD) memory (ZU) in avionics, nuclear power plants, and other complex engineering systems necessitated an investigation into the effect of external factors on the magnetic bubble state and magnetic bubble IC performance. To this end, the effect of  $\gamma$ -radiation on the performance of 256 kbit series K1602RTs2 and KRTs080101 domestic ICs is examined. The samples are irradiated in a gamma-unit at the Nuclear Physics Institute of the Uzbek Academy of Sciences with  $^{60}\text{Co}$  at a 1.25 MeV energy with a  $3 \times 10^3$  R/s dose while the magnetic bubble memory serviceability is assessed by a computer-aided monitoring system (ASK) based on an SM 1800 microcomputer. The principal functional parameters of the magnetic bubble memory ICs, the results of the magnetic bubble memory restart tests after irradiation, and the dependence of the defective registers (KDR) on the  $\gamma$ -irradiation dose are summarized. The findings show that recorded data are preserved within a  $10^7$  to  $10^9$  rad range, while at a dose above  $10^9$  rad, the number of defective registers increases and reaches 30-90 percent at  $(1.5-2) \times 10^9$  rad. When the exposure reaches  $(3-5) \times 10^9$  rad, the magnetic bubble memory is no longer functional. Tables 3; references 8: 6 Russian, 2 Western.

**Method of Examining Integrated Circuit Reliability**

927K0338E Moscow MIKROELEKTRONIKA  
in Russian Vol 21 No 2, Mar-Apr 92 pp 105-111

[Article by I.T. Aleksanyan, N.V. Chernyayev, Moscow Electronic Engineering Institute; UDC 621.382.8]

[Abstract] The inadequacy of standardized methods of the statistical reliability theory for analyzing and predicting the values of quantitative integrated circuit (IMS) reliability indicators prompted an attempt to develop new methodological approaches to the reliability theory. In particular, the so-called physical statistical simulation reliability theory which is based on an assumption that the degradation processes occurring in the chip material are the dominant cause of failures while random defects affect only the rate of these processes without altering their mechanism is considered. The new method employing this theory is based on solving the continuity equation for the distribution density function of the circuits' characteristics and then demonstrating that the solution can be used for determining and controlling the reliability indicators of highly reliable products, i.e., the products which satisfy the above assumption. Moreover, the degradation rate decreases with an increase in the parameter value deviations from the tolerance bounds; with time, the product reliability is increasingly determined by the rate of the degradation process. It is shown that timely rejection decreases the probability of early failure but does not improve the reliability and longevity indicators. Figures 2; references 6.

### New Collaboration

927K0363A Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 2-3

[Article by; V. B. Bulgak]

[Abstract] The activity of Regional Communications Commonwealth (RCC) is described. Agreement on establishing the RCC was signed at 17th of December 1991 in Moscow by representatives of eleven newly founded Republics of the former USSR. The RCC members declared that the fundamental objectives of the Commonwealth are: coordination of their activity in dealing with problems of common concern in the areas of communication services, harmonic development of communication networks and facilities, development of scientific research and tariff policies, standardization of the communications facilities, regulation of radio frequencies, training of personnel, interaction with international organizations, etc. Temporary working groups are being organized for dealing with specific problems. Representatives of the communications administration as well as specialists from scientific and service organizations also participate in this process. "Order of interaction between the RCC administration for conducting scientific and design works", including a list of scientific jointly financed project for 1992 was prepared and approved by the working group. This list includes more than 40 scientific projects, costing a total of 14 million rubles. Urgent tasks face the RCC in the communication area, where the solution to problems is most important for a normal functioning of interdependent communication network on mutually acceptable, economically advantageous conditions for all RCC participants.

### Basic Organizational and Engineering Concepts of the Uniform Automatic Communication System

927K0363B Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 4-8

[Article by; A. S. Yuzhalin, V. D. Moskvitin, N. A. Kurenkova; UDC 621.39]

[Abstract] Basic organizational and engineering concepts, corresponding to the planned third stage of the Uniform Automatic Communication System (UACS) development (up to 2005) are examined, and block diagrams of the system are provided. The UACS structure, embraces organizationally and technically, all communication facilities subordinated to the All-Union control. The UACS is a multilevel electrical communication system. The primary network of the All-Union is subdivided into main-line, regional, and local networks; the secondary networks are subdivided into telephone, telegraph, facsimile, data transmission, etc. The general composition of the functional units is described. This article was published before the development of new geopolitical situation and proclamation of independence by the former USSR Republics. However, the basic principles are also valid for the new conditions. At the present time, the communication administrations of the

sovereign states took under their jurisdiction the networks and the communication facilities located on their territories and independently determine the directions of development and sources for financing their programs. Figures 3, references 8 Russian.

### Second European Conference on Satellite Communications

927K0363C Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 14-16

[Article by; L. Ya. Kontor, M. M. Simonov, I. S. Tsirlin; UDC 621.391.15]

[Abstract] The second European Conference on Satellite Communications, ECSC-2, was held in Liege (Belgium) between October 22 and 24, 1991. It was organized by the Association des Ingenieurs de l'Institut d'Electricite Montefiore (AIM) with support of the European Space Agency (ESA), EUREL, SITEL and the Committee of European Corporations. About 200 specialists from all West European countries. Japan, USA, Canada, Hungary and former USSR participated in the conference, delivering about 90 reports on different aspects of technology and application of the satellite communication systems. The report of P.S. Weltevreden, Director of the Committee of European Corporations, pointed out the dominant role of satellite communication and broadcasting systems in organization of the European Common Market. Names of the operating and projected satellites, intended for servicing Europe were listed in the report, and are also shown here. The report by J. Grenier, titled: "EUTELSAT in a decade of challenges" concerned new East European markets, new services programs, and regulatory environment. Several reports by specialists of the ANT company (Germany), NTT (Japan), France Telecom and Matra (France) dealt with the problems of the satellite communication systems interaction with the B-ISDN network. It is noteworthy that with financial backing of the European Space Agency (ESA), companies Schrack Aerospace and Space Engineering conduct development of a conceptually new system VSAT. The report of the NTT specialists H. Jamamoto and S. Kato "Satellite and Terrestrial Integrated Services Digital Networks in Japan deserves a particular attention. The entire conference carried a spirit of integration, and cooperation. Figures 1, tables 1, references 10 Western.

### Feasibility of Constructing an Universal Digital Trunk Channel

927K0363D Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 17-19

[Article by; V. L. Bykov, G. Kh. Pankov, V. S. Rabinovich, M. M. Simonov, O. S. Tikhonov, D. A. Fedorov, V. M. Tsirlin; UDC 621.396.946]

[Abstract] Feasibility is examined of constructing an universal digital trunk (UDT) based on the MDVR-40

equipment, which is widely used in satellite lines for digital transmission of different types of information, operating in the multiple stations access mode with time sharing. The particular feature of the MDVR construction is a system of snap-shot synchronization, where the synchronization signals from different ground-based stations are transmitted separately from the information packages. The MDVR common trunk equipment is capable of operating only on particular, rigidly fixed nominal speeds of the information source. Therefore, application of the MDVR is not effective when the source speed is not a multiple of the nominal. However, the UDT can be organized using the MDVR, where the transmission of digital flow is carried out by individual modems and companders at different speeds, while each user employs the required methods of modulation and information coding. The necessary condition is a mutual snap-shot synchronization of the transmitted packages at the input to the satellite repeater, which prevents their mutual interference. The universal digital trunk is an effective method for constructing satellite communication systems. This method provides for a simultaneous digital transmission of different types of information at different speeds. With implementation of this method, the utilization factor and the transmission capacity of the satellite trunks can be significantly increased. Figures 3, references 8: 7 Russian, 1 Western.

#### **Probability of the Communication Cable's Insulating Hose Breakdown by Lightning**

927K0363E Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 32-34

[Article by; N. D. Kalinin, V. K. Khachatryan; UDC 621.316.9]

[Abstract] Computations of the number of possible damages of cables by lightning, with the equation supplied in the manual: "Protection of Telecommunication Lines and Equipment Against Lightning Discharges" prepared by the International Telegraph and Telephone Consultative Committee (CCITT), imply that the lightning-proof quality of cables in protective hoses are much worse than cables which make electrical contact with the ground. The experience does not support this conclusion. The above equation was obtained in assumptions that the voltage in the hose seeks an infinitely large value at the point where the lightning strikes, causing an inevitable breakdown of the hose insulation. Apparently, since the ground potential at the striking point is not infinite, the equation is valid only for small breakdown voltages. Based on the analysis of obtained data it was concluded that computations with the equation provided by the CCITT, of mathematical expectation of the insulating hose damages, can be made with acceptable accuracy only for the ground resistivity in the range between 25 to 200 Ohm per m, and for the hose breakdown voltages smaller than 50 kV. With large breakdown voltages and small resistivity of the ground, the error can be by several orders of magnitude greater than acceptable. With the breakdown voltages above some threshold value, the

mathematical expectation of the number of hose damages is sharply decreased. Figure 1, references 4: 3 Russian, 1 Western.

#### **Galvanic Effect and Heterogeneity of the Ground Along the Path of Communication Cable**

927K0363F Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 34-35

[Article by; E. L. Portnov; UDC 621.316.974]

[Abstract] Significant electromagnetic forces and high potentials are induced in cable communication lines located in the vicinity of power lines when they are short circuited. These forces may be hazardous for the cable, communication equipment and the service personnel. The value of the potential on the cable shell located near a sub-station or a tower where the short circuit occurred, depends on the electric properties of the cable, its location with respect to the power line grounding device, and the ground resistivity. Equations were developed for estimating the parameters of the communication cables' metallic shells traversing through one or two horizontal heterogeneities of the ground. The solution of the wave equation, which includes scalar and vector potentials, is based on the solution of the first and second Dirichlet's boundary conditions. The solution of the first problem is reduced to a linear, nonuniform, integrodifferential equation of the second kind. Figures 2, references 4: 3 Russian, 1 Western.

#### **Primary Parameters of the "Contact Rail - Tunnel wall" Circuit**

927K0363G Moscow ELEKTROSVYAZ in Russian  
No 7, Jun 92 pp 37-38

[Article by; Yu. A. Bakulin; UDC 621.396.96: 656.25(038.8)-656.259.2(033)]

[Abstract] The contact rail circuit can be used to determine the train coordinates and for organizing a communication channel with the train. By applying the pulse method for measuring the coordinates, the distance from the point where the meter is connected to the current receiver can be determined from the delay time of the reflected signal. Transverse cross section of a round tunnel is examined. The external conductor, which is the tunnel wall, is made of cast iron or reinforced concrete. The internal conductor is the contact rail, eccentrically located with respect to the axis of the external conductor. In the frequency range above  $10^5$ , the penetration depth of the current into the steel is not greater than 0.05 mm. Thus, for computation purposes, it is possible to replace the external conductor by a thin conducting cylinder, and the contact rail by a circular cross section wire. This model corresponds to a circuit of an eccentric coaxial cable, and the linear capacity of such a line can be determined. Experimental studies were conducted with a rectangular eccentric line for determination of corrections to the developed equations. Based on the results of

the study, it is possible to conclude that the eccentric line theory can be used for computation of the "contact rail-tunnel wall" circuit capacitance. Figures 4, references 5 Russian.

#### **State Telecommunications Commission Established**

927K0346A Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 p 4

[Article by V.B. Bulgak, Russian Federation Communications Minister]

[Abstract] On 7 February 1992, a State Telecommunications Commission (GKES) was set up by Russian Federation government decree No. 71 on the basis of the existing Interdepartmental Coordinating Council on the Development of the Country's Consolidated Automated Communication Network. The principal task of the commission is to coordinate the work of ministries, departments, enterprises, organizations, and institutions in setting up, developing, and improving the Interrelated Communication Network in Russian Federation (VSS RF) regardless of the property form or jurisdiction in order to ensure the engineering compatibility of all component networks at all levels and meet the reliability and operating stability requirements. The commission's authority and areas of responsibility are outlined; its work will be carried out against the background of economic reforms and a transition to different forms of property. Successful, active, and creative operation of the commission and its members will make it possible to develop and upgrade the Interrelated Communication Network under the new economic conditions.

#### **Regional Data Transmission System**

927K0346B Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 8-9

[Article by M.M. Pyankov, ITEM Informatics and Communications Partnership]

[Abstract] A prototype of the Regional Data Transmission System (RSPD) intended for public access by communications and information resource enterprises and organizations as well as private citizens to control and computer systems at the rayon, town, and oblast level is described and its block diagram is cited. The RSPD system contains a packet switching data transmission network (SPD-KP) and the following centers: message processing (TsOS), Videotex, and information service fees (TsTI). The packet switched system architecture was selected due to the light network traffic at the early stages of operation and the makeup of Regional Data Transmission System users most of whom are territorially distributed. The system uses two hardware levels and audio frequency channels at a 2,400-9,600 baud rate. Access to the system is gained by direct connection to

packet switching modules and through a switched telephone network. Future development capabilities of the new system are outlined. Figures 1.

#### **State Territorial Enterprises in Market of Goods and Services**

927K0346C Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 10-15

[Article by L.I. Nagaytsev, State Territorial Enterprise GTP-18, Yakutsk]

[Abstract] The factors which constrain the transition to a market economy are addressed and available foreign management and marketing experience is used in analyzing the strategy and structure of state territorial enterprises (GTP) (formerly called TPOs) entering the market of goods and services due to the objective nature of the economic development patterns and the political and economic changes in recent years. For illustration, the example of the GTP-18 in Yakutia is considered under the following definitions: products or services are understood as audio frequency telephone communications channels, TV channels, radio broadcast channels, telegraph channels, territorial TV services, and fax, transportation, and logistical services. The structure of the GTP-18 products or services, the goals and success factors in the provision of goods and services, the GTP-18 indicators characterizing the enterprise position and efforts in the market of communications goods and services, the GTP-18 strategic market efforts indices as compared to successful foreign companies, and the biographic profiles of GTP-18 managers as compared to successful foreign companies are summarized in detail. It is noted that the strategic market effort situation of the GTP-18 enterprise is worrisome since it calls for carrying out urgent restructuring and reorganization as well as an investment policy reevaluation. The age of the managers is also mentioned as a negative factor. Tables 5; references 4: 3 Russian, 1 Western.

#### **Business Communications: Choosing Path**

927K0346D Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 p 18

[Article by V.M. Dmitrachenko]

[Abstract] Success of the Consolidated Automated Communication Network (YeASS) and State Computer Center Network (GSVTs) are considered against the backdrop of the radical changes in the socioeconomic system and it is noted that their excessive centralization constrains the development of small local and regional networks; furthermore, large state-wide and national systems may take 10 to 20 years to be upgraded. The experience of foreign local network development, whereby thousands of medium and small companies are involved in their development and the systems themselves can be upgraded in 3 to 5 years, is summarized and the conclusion is drawn that in the field of business



communications in Russia, private network development is feasible and should proceed along two paths: maximizing the utilization of the primary and secondary YeASS networks while ensuring their maximum interaction through gateways and teleports and rapidly developing private local and regional integrated services data networks (TsSIS). The advantages and shortcomings of both development paths are debated and the concept of intelligent network is discussed. It is suggested that an intelligent network be developed in Russia on the basis of an integrated digital network ITsS-32 with a 32 kbit/s principal data channel. It is noted that Russia's Radio Engineering, Electronics, and Communications Society should play a prominent role.

#### **Hardware Complex for Digital Transmission System Automated Operation System**

927K0346E Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 19-20

[Article by A.A. Kostin, V.N. Zaytsev, N.D. Gladilin, Leningrad Telecommunications Institute imeni M.A. Bonch-Bruyevich]

[Abstract] An automated digital transmission system operation complex (ASTE TsSP) developed at the Leningrad Telecommunications Institute imeni M.A. Bonch-Bruyevich (LEIS) and implemented in the Leningrad urban telephone network is called upon to improve the efficiency and quality of digital transmission system operation by automating and centralizing the operation process. The automated digital transmission system operation complex is a subsystem of the urban telephone network's centralized operation system whose principal functions include continuous digital transmission system equipment monitoring on the basis of selected parameters, generation of control actions for the actuating systems, transmission of equipment status reports to the operations center (TsTE), fault location, display and recording of the emergency and control data at the operations center, route monitoring by various criteria, etc. Block diagrams of the automated operation complex equipment, peripheral hardware systems, and automated digital transmission system operation complex are cited. Peripheral control devices serve terminal racks of the IKM-30 pulse-code modulation equipment; each peripheral computer is a two-processor system with a set of functional modules. The hardware complex has a central microcomputer, a signal switch, an operator panel, a programmer workstation, and data entry, display, and storage devices. The hardware complex may be used in an urban telephone network of virtually any capacity and can be easily integrated with various systems due to its modular structure. System software and implementation aspects will be examined in later issues. Figures 3.

#### **Successive Search for Lumped-Distributed Synchrogroup**

927K0346F Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 21-22

[Article by I.V. Moga, Belgorod-Dnestr Regional Communications Directorate]

[Abstract] The difficulties often arising in the development of digital transmission systems, especially in determining the frame alignment recovery time of the frame alignment signal receiver, prompted an attempt to determine this parameter precisely. To this end, a successive lumped-distributed sync group search procedure is proposed. The design principle of the frame alignment signal (TsSS) receivers, primarily the sliding or successive search procedure, is outlined and the probabilistic characteristics of the successive search of a lumped-distributed sync group (SRSg) are analyzed. It is noted that the overlap ratio and false sync group formation are the most important parameters which determine the sync group structure. The number of tests to the appearance of the first false lumped-distributed sync group (LSRSg) during the random signal search is derived and the conclusion is drawn that the mean number of false lumped-distributed sync group detections in the random signal zone depends on the structure of the lumped sync group in the lumped-distributed sync group. The mean LSRSg occurrence in the random signal zone is greater than the mean number of detected false sync groups in the case where the lumped sync group is selected as the sync combination but smaller if the distributed sync group is selected. Figures 1; references 2.

#### **Transistor Tester**

927K0346G Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 p 24

[Article by V.D. Savenko, Rossvyazinform GPSI Lab, Tver oblast]

[Abstract] Extensive uses of transistors, including foreign-made, in the equipment operating at the Rossvyazinform GPSI and the limitations of available spares, accessories, and tools kits (ZIP) prompted the development of a new transistor tester which makes it possible to check the serviceability of all types of transistors, determine the purpose of transistor terminals and the structure of unmarked transistors as well as measure the back current and current gain, and classify transistors according to these parameters. The device consists of an analyzer and a meter. A circuit diagram of the new transistor tester and its general view are cited and the operating procedure is described. Figures 2.

#### **How to Improve ATSK-100/200 Crossbar ATX Operation Quality**

927K0346H Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 25-26

[Article by N.N. Shtrom]

[Abstract] Numerous unexpected situations developing during the operation of ATSK-100/200 crossbar



automatic telephone exchanges (ATSK) and a large number of requests for assistance from exchange personnel prompted an analysis of several specific causes of equipment failures and an attempt to determine ways of resolving the malfunctions. In particular, the most likely causes of double connections—a case where a subscriber picking up the phone becomes an unwilling and unwitting participant in the conversation already carried on by two other subscribers—which result in numerous subscriber complaints are considered and several ways of fixing this malfunction are suggested. Other malfunctions, such as a busy or error signal after only a part of the number is dialed, are examined and their likely causes and troubleshooting methods are described. Figures 2.

#### Flexible Active Cable Links

927K0346I Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 26-28

[Article by G.I. Sidorenko, Kiev Branch of the Central Communications Scientific Research Institute]

[Abstract] Excessive transmission system (SP) downtime due to damaged coaxial and balanced cables prompted the development of active cable links to be used between unmanned repeater sections of up to 3 km long. The cable links are developed by State Territorial Enterprises (TPO) Nos.9 and 3 of the Technical Centers for National Mainline Communications and Television Nos.4 and 8, respectively (TUSM). The flexible links are intended for setting up temporary connections with damaged mainlines located at the centers of natural and radioactive disasters. The flexible cable link design is shown and the attenuation behavior and level diagram of a 3 km long cable link between two unmanned repeaters (NUP) for the K-3600 and K-1020 transmission systems are cited. The specific design features of the cables links for the K-3600 and K-1020 transmission systems are outlined: the former is made on the basis of the VKAP and RK-75-4-16 cables, K-3600 containers, and Rx364.0053 and Rx364.5240 tips; the latter—on the basis the P-296 cable and compensating amplifiers (KUS). Cable link laying procedures are described and the effect of noise and interferences is discussed. The use of flexible links makes it possible to use a simplified service restoration algorithm. Figures 2.

#### Who Loses and How Much

927K0346J Moscow VESTNIK SVYAZI in Russian  
No 6, Jun 92 pp 30-31

[Article by M.A. Gorelik, M.N. Osadchaya, N.V. Rodicheva, MTUSI]

[Abstract] The economic impact of the transition to a market economy in the telecommunications industry is assessed against the backdrop of a steadily increasing use and prominence of data services. Russia's poor performance in this field is illustrated by comparative data and it is noted the country is ahead only in common carrier telegraph communications (TGOP). The specific impact

of the lag in the area of long-distance telephone communication (MTS) and rural (STS) and urban (GTS) telephone networks on various branches of the national economy is examined on the basis of an analysis carried out at the Moscow and Leningrad Telecommunications Institutes and the Leningrad Branch of the Central Communications Scientific Research Institute. In 1990, total losses by all branches of the national economy and by the population (vs. the 2010 level) reached 70 billion hours, 78 percent of which was lost in productive spheres. Each ruble not invested in telecommunications development leads to a loss of 1.7 h, a 7.2-fold increase in expenditures, and a 3.1-fold increase in the national income. Thus, the total GNP losses in 1988 (vs. the 2010 level) is estimated as 240 billion rubles, 50 billion of which is due to poor local telephone networks. The total national income loss at today's level of telecommunications development is 165.3 billion rubles due to disruptions in service alone. User losses due to the low telecommunication development level are so high that the entire investment policy must be reassessed and the loss figures must be incorporated in future feasibility studies in the industry.

#### Moscow Ringed With Optical Fibers

927K0345A Moscow VESTNIK SVYAZI in Russian  
No 5, May 92 p 9

[Article by S. Zelenskaya]

[Abstract] A presentation made by the Fiber Optic Technology Development Fund at the Moscow International Trade Center on 21 Feb 92 is summarized and the Fund purposes, particularly to stimulate the production of new equipment and establish beneficial ties among the producers and consumers, are outlined; it is noted that the Ostankino TV and Radio Center is already linked to the TV tower by a fiber optic line. Plans to lay optical cables in existing subway tunnels so as to encircle the city with optical fibers, link the boroughs to each other, and lay the foundation for a wide-band integrated services data network are described.

#### Expert Training in Fiber Optics Field

927K0345B Moscow VESTNIK SVYAZI in Russian  
No 5, May 92 p 21

[Article by S.A. Galkin, A.A. Gogol, M.A. Sivers, V.T. Divakov, Leningrad Telecommunications Institute imeni M.A. Bonch-Bruyevich and Russian Federation Communications Ministry]

[Abstract] The need for a wide-ranging expert training program in the field of fiber optics necessitated by the rapid implementation of fiber optic communication systems in various networks is discussed and the first

optical data transmission system department in the country organized at the Leningrad Telecommunications Institute imeni M.A. Bonch-Bruyevich in November 1982 is described. In cooperation with other department, the new entity is charged with the task of thorough training and retraining of engineers in the field of fiber optics. The specific activities of the departments participating in this program are outlined and the institute's contractual activities brought about by the commercialization and a transition to self-financing as well as its ongoing cooperation with academic institutions and companies in the United States, China, Syria, the Balkans, and Poland are summarized. The institute is preparing for the second international fiber optics conference to be held in St. Petersburg on 5-9 Oct 92.

#### **'Avtomat-A' to Replace 'Avtomat-M' Hardware-Software System**

927K0345C Moscow VESTNIK SVYAZI in Russian  
No 5, May 92 pp 28-30

[Article by V.A. Manokhin, A.B. Kulman, Starvest Russian-Estonian Scientific Production Company]

[Abstract] The Avtomat-A developed by the Starvest Russian-Estonian Scientific Production Company—an upgraded version of the Avtomat-M hardware and software complex (APK)—is to be implemented in many CIS regions. The use of a more advanced microcomputer and software makes it possible to expand the capabilities of the earlier models and widen its control sphere as well as increase the operating efficiency and reliability. The complex is intended for use in public access and private networks for automatically checking the telephone networks by embedded routines assigned by the dispatcher by means of control calls to automatic answer-back devices and detecting emergency network faults at any time of day. The structure and operating principles of the automatic system and its components, the computer system design, and the advantages of the new system over the old one are described and a block diagram of the Avtomat-A base hardware-software complex is cited. The system can be configured in three different ways for shipment. Its principal component is a Korvet KL-8 microcomputer (an Elektronika D3-28 was used in earlier models). The implementation outlook of the system is assessed. The company is offering its installation and set-up services. Figures 1.

#### **Scientific Research Institutes Under Economic Reform Conditions**

927K0345D Moscow VESTNIK SVYAZI in Russian  
No 5, May 92 pp 34-35

[Article by A.Ye. Krupnov, Russian Federation Communications Ministry]

[Abstract] The effect of the scientific development in the society on the level of its well-being and the role of the state on promoting scientific research and development

are discussed and suggestions are made for drafting the Law of State Scientific Research Policy: it is stressed that state support for science is crucial for the success of this policy. To this end, steps to be taken in order to raise the communication science level, enhance scientific and engineering progress in the industry, and maintain the competitiveness of the skill-intensive communications industry and its products are outlined; these include primarily tax relief and other investment incentives. The need for an organizational overhaul of the communications R&D enterprises and scientific research institutes and for adapting them to the market economy is emphasized and the role of the profit factor is stressed. The market conditions and a rapid increase in the demand for modern communication services call for greatly improving the efficiency of R&D work and increasing the scientific and technical potential of the industry.

#### **In Step With Time: Fortieth Anniversary of Ryazan Radio Engineering Institute**

927K0344A Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 2-4

[Article by V.K. Zlobin, S.L. Sokolov]

[Abstract] The achievements of the Ryazan Radio Engineering Institute (RRTI) since its founding in December 1951 when it had only three schools, nine departments, 315 students, and 29 instructors and was headed by K.A. Sapozhkov, until today, when it has five day schools and one evening school which now train 5,700 graduate and undergraduate students at 31 departments employing more than 600 instructors, is summarized. The institute has an extensive academic science base and about 100 labs, a student computer center, and terminal desks for 200 students. The institute's activities related to the transition to a market economy whereby the school provides training and R&D work under contract to various entities are outlined and its international scientific and engineering links are mentioned. In the last three years, the institute has published 350 monographs, teaching aids, and articles and 240 patents. The institute's staff participated in the development of silicon thermoelectric converters, a laser-based Doppler flow velocity meter, and a high-speed vacuum tube switch. The need to utilize all available forms of economic activity under the new economic conditions, i.e., state programs, implementing R&D results in small enterprises, providing paid services, and carrying out khozraschet R&D work, is stressed. Figures 5.

#### **Statistical Procedures of Successive Analysis of Discrete Communication Channel State**

927K0344B Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 6-7

[Article by L.P. Korichnev; UDC 621.391.175:658.012.011.56]

[Abstract] The shortcomings of discrete communication channels for data interchange in today's computer networks, particularly the difficulty of ensuring a specified monitoring confidence and promptness, necessitated the development of statistical procedures for successively analyzing the state of such discrete communication channels. To this end, a general technique is proposed for developing successive and truncated sequential procedures of testing the statistical hypotheses for the parameter value characterizing finite dimensional multiplicative distributions of the random sequences of errors. In so doing, a broad class of sequences characterized by a certain bounded set of parameters is considered as the initial sequences. The general premises of the theory of statistical hypothesis testing, a technique for developing the checking procedures, and statistical hypothesis tests are studied in detail. The proposed discrete channel checking procedures make it possible to realize a 40-60 percent decrease in the necessary number of tests compared to nonsequential procedures while ensuring the same level of confidence. References 3.

#### **Adaptive Control in Discrete Information Transmission Systems**

927K0344C Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 8-10

[Article by A.N. Pylkin; UDC 621.391]

[Abstract] The complex group patterns of the errors and the parameter instability in discrete information transmission systems (SPDI) operating as a part of computer and distributed control system networks utilizing existing channels prompted the development of adaptive control principles which ensure the specified probability-time characteristics (VVKh) of data transmission processes. Such adaptive control methods are the most expedient from the viewpoint of error protection based on the discrete information transmission system control strategies which change as a function of time. The general adaptive control development problem is formulated and a block diagram of an adaptive control procedure is cited. A quasistationary discrete channel (DK) error model is formulated for developing a mathematical model of errors which takes into account the complex group and unsteady behavior of errors under the effect of external factors; discrete channel states are identified. Analyses of the probability-time characteristics of discrete information transmission system with a functioning condition adaptation, i.e., adaptable transmission rates, alternative block lengths, changing encoding and decoding conditions, or frequency channel self-selection, make it possible to select the optimum discrete information transmission system parameters and determine and compare the efficiency of various procedures. Figures 1; references 12.

#### **Video Data Normalization in Remote Sensing Systems**

927K0344D Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 12-14

[Article by V.K. Zlobin, V.V. Yermeyev; UDC 528.7:629.78]

[Abstract] The need to normalize or correct remote sensing data on the earth's surface received from satellites (due to geometric and radiometric distortions) prompted an analysis of numerous efforts undertaken by the staff of the Ryazan Radio Engineering Institute in order to develop multispectral satellite scanner data normalization systems. The principles of geometrical correction of multispectral remote sensing data in a single-processor system, multiprocessor geometrical correction, and radiometric correction are examined in detail and approaches to streamlined single- and multiprocessor correction of multispectral images are developed on this basis. The method is especially suitable for small- and large-sized earth stations and is realized by the Main Satellite Data Reception and Processing Center. The multiprocessor technology makes it possible to lower the geometrical length, area, and angle distortion levels of satellite images by approximately thirty-fold, ensure radiometric correction which is accurate within 0.2 percent, and set up on-line database support for a number of branches of the national economy and government. References 7.

#### **Phase-Structure Method of TV Picture Signal Spectrum Compression**

927K0344E Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 17-19

[Article by S.A. Suslonov; UDC 621.397]

[Abstract] The high digital signal transmission rate and bandwidth of high-definition TV systems call for signal spectrum compression; consequently, a method is proposed for compressing the transmitted picture signal spectrum, i.e., effectively lowering the transmission rate, by coding it at a sampling rate below that stipulated by Kotelnikov's theorem. To this end, the phase structure of the video signal is transformed by introducing a phase redundancy signal to the signal structure. A TV signal model is formulated and the principle of the spectrum compression method is examined. The sampling error equalization procedure, the sample reconstruction error estimate, residual sampling noise equalization, and the mean peak-to-peak interval analysis are considered and the phase-structural method realization is illustrated. The reconstructed phase transformed signal has two types of samples: even, or representing the true or transmitted samples, and odd, produced after linear and nonlinear transformations. The proposed method is based on transforming the phase of elementary sampling functions as simple signals into composite LFM video signals, sampling this signal at intervals equal to two



Kotelnikov's intervals, and reconstructing them on the receiving end. References 12: 11 Russian, 1 Western.

#### **Determining Time Position of Coherent Pulse Train**

927K0344F Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 22-23

[Article by D.I. Popov; UDC 621.391.26]

[Abstract] An irregular (in the sense of its time position) pulse train with the most general notions of pulse shape is considered in the framework of the radio signal detection theory against the background of an unknown direct component without *a priori* information about the pulse sequence properties. The latter factor makes it impossible to use traditional methods for detecting the pulse sequence and estimating the pulse and background parameters. Consequently, it is suggested that this task be solved in two stages using an orthogonal approximation in the  $L_2$  metric. The task is further formulated as estimating the background and reconstructing the pulse train elements on the basis of its observation in two steps: jointly estimating the background and detecting individual pulse train elements; and reconstructing the pulse train. Pulse train element detection is considered in detail and the results of computer simulation of the problem are cited for illustration. Figures 3; tables 1; references 3.

#### **Optimum Design of Multistage Digital Filter Structures Using Signal Processors**

927K0344G Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 pp 23-27

[Article by V.V. Vityazev; UDC 621.372.54.037.372]

[Abstract] Work on developing the theory and improving the methods of digital signal frequency discrimination systems for various purposes carried out at the Ryazan Radio Engineering Institute and the efforts aimed at using the digital decimation principle for developing such systems, undertaken in other countries, are reviewed against the backdrop of optimum digital filter design by means of signal processors. The task of optimum design is formulated and formalized and optimum synthesis of a two-stage structure is considered using the examples of polyphase and parallel design forms. The proposed technique for optimum design of the multistage structure of a narrow-band filter using a variable sampling rate on a single chip digital signal processor is based on a multicriterial approach which takes into account the reconstruction accuracy of the desired frequency response as well as the hardware outlays for making the digital finite impulse response digital filter for this purpose. An analysis of the filter parameter using this method makes it possible to utilize the internal resources of digital signal processors most fully. Figures 2; tables 2; references 22: 17 Russian, 5 Western.

#### **Development of New Klystron Designs and Analysis Methods and Routines**

927K0344H Moscow ELEKTROSVYAZ in Russian  
No 4, Apr 92 p 39

[Article by V.P. Panov, V.K. Fedyayev, A.A. Shishkov; UDC 621.385.62]

[Abstract] The outcome of the studies of klystrons with a ribbon beam whose width is comparable to the wavelength carried out at the Ryazan Radio Engineering Institute and efforts aimed at developing the methods and analysis routines for designing optoelectronic systems, resonators, and electronic microwave processes in klystrons are discussed. These studies have been conducted since the 60's at the Department of Electronic Devices under the leadership of V.P. Panov, A.G. Antsiperov, A.N. Balyabin, and others. An application software package is developed on the basis of earlier mathematical models for numerical analyses of optoelectronic systems (EOS) and nonlinear electronic processes in klystrons. The computation routines are realized for the Consolidated Series YeS computers and modern microcomputers. The methods and designs are being used for studying the nonlinear electron bunching and interaction with two- and three-dimensional electric and magnetic fields and for developing practical klystron design recommendations. The computer routine developed at the institute is characterized by time savings and its high accuracy.

#### **Intelligent Network: Intelligent Terminals in ITsS-32 Integrated Digital Network**

927K0343A Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 4-6

[Article by L.Ye. Varakin, V.G. Osipov, M.U. Polyak, V.M. Polionov, Yu.I. Filyushin; UDC 621.395:383/384:339.94]

[Abstract] A new multifunction user terminal which would enable ITsS-32 integrated digital network (ITsS) users to gain access to various telematics, data transmission, and audiovisual services and make it possible to develop an ISDN with a 32 kbit/s digital stream and bring it directly to the subscribers is discussed and the characteristics of the existing ISDN terminals used in analog public telephone networks (TFOP) are outlined. The structure and design of the new intelligent terminal for the ITsS-32 ISDN is explained and its block diagram is cited; the capabilities of various digital and analog terminals in transmitting files of different sizes are summarized. The design and capabilities of a multifunction telephone set and terminal adapter are presented and the ITsS-32 intelligent terminal's protocol architecture is analyzed. The proposed intelligent terminal designed on the basis of a multifunction digital telephone set and a microcomputer together with the terminal adapter will make it possible efficiently and more flexibly to implement various additional services in the framework of the intellectual network concept. The

article is a continuation of a discussion which began in *Elektrosvyaz* No 1, Jan 92. Figures 8; tables 1; references 7: 4 Russian, 3 Western.

#### **Certain Issues of Telematics Services Development**

927K0343B Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 7-10

[Article by V.O. Shvartsman; UDC 621.394.4]

[Abstract] The role of information processes in the life of the society is analyzed against the backdrop of a constantly increasing saturation of all spheres of life with data services and it is noted that in recent years, public on-line access to remote databases is becoming one of the fastest growing trends in the telematics services development. The examples of advanced Western countries in this field, primarily the United States, is summarized and criteria for evaluating various telematics services are formulated. For illustration, the specific features of the Teletex, Videotex, and Teletext are considered and mixed message processing services, i.e., text and graphics, are examined. Communications security features and the use of digital signatures are studied. The conclusion is drawn that informatization of the society is indispensable for developing an infrastructure ensuring technical support for the national economy under market conditions; the limited number of computer-literate workers is blamed for the country's lag in the information system development. It is emphasized that the most current CCITT (MKKTT) recommendations should serve as a blueprint for future information services development. The need for a legislative and legal framework for the information services development is stressed. Figures 2; references 9.

#### **Application Features of Standard Open System Interaction Model in 'Videotex' Service**

927K0343C Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 13-15

[Article by L.M. Misonzhnik, V.S. Sklyar, T.V. Slizskaya, G.B. Tretyak; UDC 621.394.4]

[Abstract] The characteristic features of the standard open system interaction model (EMVOS) utilization reflected in CCITT Recommendation X.200 for selecting standardized procedures are considered against the background of the world-wide development and operation experience of the Videotex service; the Videotex system configuration—public and private editing terminals (OU) interacting with a service center (STsV) through a switched telephone network, a database (BD), and a workstation (RM)—is analyzed. The standard model is divided into five layers each of which characterizes the specific system architecture and can be in an active or passive state: physical, data transmission, data session, data presentation, and application. All layers except for the application layer provides a specific

range of services to the users. Each standard model layer is examined in detail. The characteristic features of the application process interaction between the service center and the database and service center and the workstation are outlined. The use of the standard open system interaction model in designing a service makes it possible to ensure system interaction with other regional Videotex services and other telematics services in the future. Figures 2; references 6.

#### **Role of Satellites in Consolidated Automated Communications Service**

927K0343D Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 19-22

[Article by S.V. Borodich; UDC 621.317.08]

[Abstract] Despite more than twenty five years of operation, satellite communications in the country still play a limited role in the Consolidated Automated Communications System (YeASS), primarily due to a monopoly in space communications which the developers have enjoyed for a long time and a low level of domestic technology. The properties and capabilities of satellite communications are considered and it is noted that satellite systems have a much lower capacity than terrestrial communications systems. As a result, satellites are called upon to provide services to area-wide and rural networks and to distribute TV, radio, and other broadcast information throughout the country. There is a danger that if the satellite development monopoly is maintained, new satellites, designed to replace the Gorizont and other old satellite, will have the same flaws as their predecessors. The conditions for realizing the power and frequency potential of the satellite repeater channel in general and the conditions for realizing the potential capacity of the Gorizont satellite channel in transmitting digital signals in the frequency division multiple access (MDChR) and time division multiple access (MDVR) modes are formulated. The study makes it possible to design optimum energy parameters of the satellite and earth stations which make it possible to realize the full potential of the repeater channel capacity on the basis of the requirements imposed on setting up a network in a territory of a given size with a specified quality of communication. It is noted that state of the art satellite development abroad should be used as a guideline. Figures 6; references 4.

#### **Investigation of 8-Phase Signal Radio Relay Transmission System at 90 Mbit/s Rate**

927K0343E Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 23-24

[Article by V.N. Nikitin, F.A. Pevzner, I.O. Filosofov, G.B. Khayn; UDC 621.396.43:621.396.5.001.5]

[Abstract] Rapid advances in the development of digital radio relay transmission systems (TsRSP) combined with their lower capacity than that of analog systems



prompted attempts further to increase the digital transmission system capacity; to this end, the characteristics of high-speed digital stream transmission over radio relay transmission systems (RSP) are studied in order to develop versatile radio electronic equipment which would make it possible to design radio relay links (RRL) for various purposes. The basic features and design of digital radio relay transmission systems are considered and their specifications are summarized. A simplified block diagram of the transceiver equipment and block diagram of the modulator and demodulator are cited and the through characteristics of the amplitude frequency response (ACHKh) and group delay time (GVZ) of the transceiver system as well as the dependence of the received information confidence on the frequency detuning and the dependence of the error rate on the signal:noise ratio at the demodulator input and signal level at the receiver input are plotted. While realization of a high-speed digital radio relay transmission systems using an OFM-8 differential phase shift keying principle, i.e., an 8-phase DPSK, is still fraught with difficulties, the above system may serve as a possible path toward developing such systems for multichannel telephony and multiprogram digital television using a domestic component base. Figures 6; tables 1; references 4: 2 Russian, 2 Western.

#### Digital Transmission System Confidence Prediction

927K0343F Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 25-26

[Article by N.N. Bazhenov; UDC 621.376.57]

[Abstract] Data transmission confidence of digital systems using cable networks is the principal cable and transmission system suitability criterion which, in the end, is characterized by the error probability; this calls for simulating the digital transmission system (TsSP) line circuit under known noise statistics. The model entities are formulated and a simulation model is developed on the basis of a double Fourier transform method (DPF). A timing chart of the general transmitter signal allowing for the arbitrary mark and space alternation in the pulse polarity alternation (ChPI) code is plotted and an experimental distribution simulation algorithm and a channel simulation algorithm are cited. For illustration, a pulse code modulation IKM-30 system repeater leg is considered. The proposed approach to determining the digital transmission system error rate is suitable both for designing a communication system and examining the weight of various noise parameters leading to signal errors. It is noted that the errors are grouped in time but their fluctuating character leads to a certain "thinning" of the digital stream due to a coincidence of the regular cosine-curve and the random line signal. Figures 3; references 8

#### Methods of Solving Problems of Estimating Optical Communication Cables and Increasing Their Efficiency

927K0343G Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 27-29

[Article by V.N. Korshunov; UDC 621.315.2]

[Abstract] Wide-ranging implementation of optical cables (OK) and the need to develop new and upgrade existing cable lines prompted an analysis of the methods of estimating the characteristics of optical communication cables and improving their performance. A general approach to solving this problem is formulated whereby the optical cable is treated as an engineering system and its operating efficiency is defined as the degree to which it corresponds to the real and required results which reflect the purpose of the operation; a formula is derived for the modulus of this correspondence. The operation efficiency analysis which forms a problem—decision chain is divided into a conceptual analysis, operations research, and decision-making. The study is illustrated by examples of assessing the efficiency of various optical cable designs using different criteria, such as the necessary length margin, probability of survival, guaranteed operational reliability, maximum repeater leg of a single-mode graded index cable, operating stability under varying temperature conditions, and minimum cable cost. Overall, the problem entails a complex of conditions with a considerable degree of uncertainty and can be solved fully by a multistage optimization procedure yet individual solutions may be suitable for the specific design tasks. Figures 4; tables 1; references 17.

#### Communication System Protection From Pulsed Electromagnetic Fields

927K0343H Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 33-34

[Article by A.M. Kalyagin, S.I. Kachkurkin; UDC 621.395.51:621.315(001.2)]

[Abstract] A manuscript deposited with the Informsvyaz Center of Scientific and Technical Information under No. 1877-sv is reviewed. The manuscript is a brief summary of foreign publications dealing with protection of communication facilities from the effect of lightning discharges recorded in the United States, Sweden, Holland, France, and South Africa. The issue of protecting aerial and cable communication lines from electromagnetic pulses (EMI) produced by high-altitude nuclear explosions (VYaV) is also addressed; the difficulty of fully taking into account the effect of lightning discharges and high-altitude nuclear blasts prompted an approach whereby a compromise is made between the cost of R&D work and outlays for implementing protective measures. References 1.

**Software and Hardware Specifications of PBX  
Interaction With Telephone Network**

927K03431 Moscow ELEKTROSVYAZ in Russian  
No 2, Feb 92 pp 36-39

[Article by B.S. Goldshteyn, A.Ye. Kucheryavyy, L.G. Slutskiy; UDC 681.395]

[Abstract] The ongoing "digitization" of public telephone networks and the proliferation of stored-program private business exchanges (UPATS) in the country prompted the Leningrad Branch of the Central Communications Scientific Research Institute (LONIIS) to develop specifications of a software and hardware complex for controlling the interaction of PBXs with the nation-wide telephone network. A methodology developed by the LONIIS for developing the interface specifications which includes the

signaling system logic and telephone traffic script is outlined. The proposed technique is based on the structured design concept and series Z100 Blue Book CCITT recommendations. A simplified flow chart of the design of additional PBS software and hardware facilities (PAS), a block diagram of the specifications design method which calls for a fitness analysis and debugging at the design stage, and an SDL interaction diagram are cited. System specifications are designed using the "tell what you are going to say, then say it, then tell what you have just said" principle; in this case the PBX/network interface is sufficiently formalized using Algol or Pascal notations except for the ones stipulated by the SDL language. Applications of this method demonstrate its efficiency for designing interaction software and hardware. Figures 7; tables 3; references 4: 3 Russian, 1 Western.

### **Economic Mechanism of Energy Conservation in Moscow's Industry**

927K0342A Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 2-4

[Article by V.V. Zhizhin, D.I. Kharaz, N.I. Ryabtsev, Tekhnergokhimprom Scientific Production Association, Moscow; UDC 621.311.1.004.18]

[Abstract] The economic incentives and mechanism of energy conservation in Moscow's industry are investigated against the backdrop of the findings by the Energy Research Institute indicating that today's energy saving potential reaches 36 percent of the 1990 energy consumption level. In Moscow's 340 power companies, energy conservation is achieved in two ways: constantly maintaining optimum energy utilization parameters and taking one-time energy conservation measures, i.e., administrative and technical steps (OTM) aimed at eliminating losses. The energy resource conservation results according to two sources and the percentage savings from the implementation of administrative and technical measures for the specific energy and fuel resources (TER) (in equivalent fuel tons) and the principal trends in energy and fuel resource conservation are summarized. The scope of the proposed system for effective heat conservation management in Moscow, i.e., its areas of jurisdiction, is outlined and a new two-tier thermal energy rate structure is suggested. Fees for thermal energy uses and penalties are to finance an Energy Conservation Fund and incentive funds. It is speculated that implementation of the energy conservation measures will benefit the consumers in that it will assure them that their heat and power demands will continue to be met and they would not have to ask for higher allocations, thus lowering the total heat consumption and bringing supply in line with the demand. To this end, economic incentives are called upon to facilitate the implementation of these measures even when considerable capital outlays are necessary. The role of the rising fuel prices is expected to play a positive role. Tables 3.

### **TTP(Ye)1 Series Frequency Converters**

927K0342B Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 7-9

[Article by P.D. Andriyenko, A.V. Volkov, A.G. Lokhmatov, All-Union Scientific Research Institute of Converters, Zaporozhye; UDC 621.314.26.001.8]

[Abstract] Series TTP(Ye)1 frequency converters manufactured by the Zaporozhye Electrical Instrument Plant for controlling the delivery and capacity of pumps, fans, and compressors by manipulating the rotation speed of the induction squirrel cage motors driving them are considered and standard converter model designations are listed. The specifications and performance parameters of six frequency converter models are summarized. The converters are intended for operating within a 1-40°C temperature range at a 90 percent air humidity

and an elevation of up to 1,000 m above sea level in a nonexplosive noncorrosive environment. Brief power supply voltage deviations from +20 to -30 percent are tolerated. In addition to controlling the induction motor speed or frequency, the converters are capable of controlling the output voltage within 0-380 V, accelerating, braking, and shutting down the motor, setting the specific frequency variation law, starting up motors, etc. Compared to throttle valve-controlled devices, the converters ensure a 15-40 percent electric energy savings and increase the operating reliability and service life of electric motors and switching devices. Their pay-back period is equal to one to three years. Figures 1; tables 1.

### **Investigation of Overvoltages in 6 kV Industrial Enterprise Network With Large Number of High-Voltage Motors and Capacitor Banks**

927K0342C Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 22-25

[Article by G.Ya. Vagin, V.A. Chechkov, F.V. Sharutin, Nizhniy Novgorod Polytechnic Institute; UDC 621.316.1.027.7.015.38]

[Abstract] The insufficient dielectric strength of 6-35 kV high-voltage equipment with regular insulation, especially at biochemical enterprises which are characterized by a large number of high-voltage induction motors and powerful compensating capacitor banks with 6 kV cable power lines prompted an investigation into the internal overvoltage conditions in such power networks; external overvoltages are not considered since the cable networks are well protected from atmospheric discharges. An insulated-neutral system is studied for illustration. A schematic diagram of a typical distribution power network section of a biochemical enterprise is cited and the probability of exceeding the overvoltage ratio under a single-phase arcing ground fault (OZNZ) with connected and disconnected cable lines and capacitor banks, as well as various combinations of these elements, transformers, and electric motors is plotted; the characteristics of the transient processes during the capacitor bank switching are examined. An analysis shows that in 6 kV cable power networks, the switching (transient) surge level which may exceed the test overvoltage level should be selected as the design value while the use of high-resistance grounding devices makes it possible to lower the surge ratio and thus reduce the insulation wear. The joint use of nonlinear overvoltage limiters in the load nodes and RC-networks at the high-voltage motor terminals limits the peak voltage, decreases the leading and trailing edge slopes, and localizes the surge wave propagation. These RC-circuits are especially effective with a 50-70  $\Omega$  resistance and 0.2  $\mu$ F capacitance. Figures 2; references 7.

### **Analysis of Power System Short Circuit Information System**

927K0342D Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 26-29

[Article by B.N. Neklepayev, A.A. Vostrosablin, Moscow Energy Institute; UDC [621.311.1.064.1:659].001.2]

[Abstract] Frequent short circuits responsible for violations of the normal electric plant and energy user operating conditions and trigger the relay protection and emergency circuit breaker (RZiA) devices which must be reset by the service staff prompted the development of a fault information system. The system contains the devices and instruments which record the short circuits in the electric power system (EES) and their parameters, log short circuits and the relevant systems, and warn the service personnel and transmit data. The specific devices which record the short circuit parameters and the short circuit recording and monitoring system are described and the primary sources of short circuit information are analyzed. A flow chart of primary fault data sources and the procedures for their location and parameter recording is cited and the individual fault parameters recorded for each type of electric plant together with the primary information source are summarized; data on different types of short circuit faults in 100, 220, and 500 kV systems are presented. The conclusion is drawn that the drawbacks of the existing data system leads to losses and corruption of data on short circuits in electrical plants. The need to develop and implement a unified integrated system for collecting, processing, and displaying data on faults in electric power systems is stressed and it is noted that primary information sources should be incorporated in new information system designs. Figures 1; tables 2; references 8.

#### **On Issue of Power Supply Center Siting at Industrial Enterprises**

927K0342E Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 30-32

[Article by B.I. Goldenblat, Design Institute No. 2, Odessa; UDC 621.311.1:658]

[Abstract] The task of selecting the site of transformer substations and distribution centers in industrial enterprise compounds and production rooms is considered allowing for the real plant layout, transport lines, and other conditions which are traditionally ignored by designers. The power supply center (TsP) siting task is more complicated than other problems which can be solved analytically due to the need to incorporate the above conditions in the design. The factors which determine the site selection are addressed and an attempt is made to justify the power supply center location and optimize the selection task. To this end, the number of possible sites which exceeds the number of power supply centers is determined and the problems which determine the actual site selection are solved. Three combinations of power supply center capacity or resources are considered and a matrix of the electrical installation distance to three power supply centers (out of the five possible sites) is constructed by solving a multidimensional extremal problem on a computer. The problem of siting three power supply centers with 22 power users (PP) is solved for illustration. The proposed siting method reflects the real design conditions and makes it possible to take into

account the variety of factors while the solution itself is optimal. Tables 2; references 3.

#### **Need for Forcibly Limiting Overvoltage in Low-Voltage Network**

927K0342F Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 pp 39-41

[Article by V.G. Goldshteyn, F.Kh. Khalilov, Samara Polytechnic Institute and St. Petersburg State Engineering University; UDC 621.316.1.015.38]

[Abstract] The low reliability of low-voltage circuits and networks due to their low insulation resistance and the resulting economic losses from the damage inflicted by surges in low-voltage (NN) networks and circuits prompted the development of forced overvoltage limiting devices which respond to such surges and lightning, transient conditions during the reactive load switching, and short circuits. The standards covering the overvoltage protection devices in other countries, e.g., FCC, are reviewed and the lack of relevant standards in Russia is noted. The results of a study of overvoltages in 220/380 V power networks carried out at two enterprises—automotive and ball bearing plants with 6/0.4 or 10/4 kV, 250-630 kVA transformers and electric motors as the load—are discussed and specifications for electrical equipment protection devices are suggested. Peak detectors made at the St. Petersburg State Engineering University are used to record the overvoltage. The overvoltage ratio distribution probability and the comparative number of annual surges with a ratio exceeding a specified value are cited and the characteristics adopted for nonlinear overvoltage limiters are summarized. The conclusion is drawn that since overvoltages in <1 kV networks are capable of causing severe damage, nonlinear overvoltage limiters should be used as a crude low-voltage protection device. Figures 2; tables 1; references 6: 3 Russian, 3 Western.

#### **Chronicles of Russia's Scientific Technical Society of Power Engineers and Electricians**

927K0342G Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 6, Jun 92 p 54

[Article by Editorial Board; UDC [061.22:620.9].001.5]

[Abstract] The Directorate of Russia's Scientific Technical Society of Power Engineers and Electricians (NTOE) is soliciting contracts to perform the following services using its highly-skilled personnel: upgrading brushless exciters for the T-2.5-2, T-4-2, T-6-2, and T-12-2 turbogenerators and STD-630-2 and STD-12500-2 induction motors; and diagnosing and forecasting the corrosion processes in thermal power systems and equipment and performing chemical process treatment which decreases the metal corrosion in these systems and equipment. The society's track record in these fields is cited.



**Economic and Management Steps to Improving Power Generating Plant in Machine Building**

927K0341A Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 2-5

[Article by B.Ya. Tatarskikh, Samara Economic Institute; UDC [658.26:621].004.68.003.12]

[Abstract] The importance of improving and upgrading the maintenance and servicing of power generating equipment in machine building for increasing its efficiency under the conditions of ongoing scientific and technical progress is discussed and the dynamics of the percentage of machine building operations in 1956-1989 are summarized. The factors which necessitate improvements in equipment repairs and maintenance and call for upgrading maintenance and repair worker skills under increasingly stringent requirements for equipment pool availability and readiness are analyzed and the need for developing clear methodological premises for improving the repair and maintenance efficiency are outlined. The dynamics of the relationship between the repair volume of the mechanical and electrical parts of basic production equipment from 1955 until 1990 and the basic equipment pool dynamics of the machining, forging, welding, and casting shops are examined. An increase in the power-to-weight ratio of the maintenance and repair functions is identified as one of the principal production efficiency conditions, especially due to a steady outflow of workers from mechanical engineering enterprises. Tables 3; references 1.

**Experience of Using Sulfamic Acid to Remove Carbonate Scale Deposits From Hot Water Heaters at Kalinin Nuclear Power Plant**

927K0341B Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 8-11

[Article by V.I. Maksin, O.Z. Standritchuk, I.G. Vakhnin, S.V. Sakulina, N.N. Davidenko, Colloidal and Water Chemistry Institute at the Ukrainian Academy of Sciences, Kiev, and Kalinin NPP, Udomlya; UDC [697.328+621.182.44]:54-32.004.1.001.2]

[Abstract] The urgency of descaling the inside surfaces of hot water heaters due to imbalances in the water-chemical treatment conditions prompted a study of the possibility of using sulfamic acid for removing carbonate scale deposits; it is noted that available data on practical uses of sulfamic acid for this purpose do not reflect important application aspects. The solubility of sulfamates and similar mineral acid salts for the metals used most often and the scale composition are summarized. The dependence of the apparent dissolution rate constant of carbonate scale in sulfamic acid solutions on the solution temperature and the pH curves of the control medium used for checking the descaling process are plotted. An experiment using a descaling test unit is described; an 8 percent  $\text{HSO}_3\text{NH}_2$  solution with a constant recuperation and spent solution regeneration is used. The descaling process is conducted for 12.5 h; a

visual inspection after the treatment reveals no scale deposits or noticeable traces of corrosion. Figures 3; tables 2; references 11: 8 Russian, 3 Western.

**Minsk Subway Computer-Aided Power Metering and Monitoring System**

927K0341C Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 14-17

[Article by V.K. Aviltsev, Minsk Subway; UDC 681.518.52.004.11]

[Abstract] The need for on-line data on the power demand of electric traction transport enterprises in order to optimize the operating indicators prompted the development of the IISE-3NS computer-aided power metering and monitoring system. In the Minsk subway network, such a system is set up on the basis of an IBM PC/XT microcomputer (PEVM) which has a data link to upgraded IISE-3NS systems through an underground communication channel. A block diagram of the computer-aided power metering and monitoring system, a thermal power user connection diagram, and the heat meter circuit diagram are cited and the power consumption parameters of the subway system are summarized for various services. The system monitors all types of thermal and electric power users; the thermal power consumption is recorded by the hot water rate at 19 thermal points. The dispatcher center is equipped with an IBM PC/AT-286 microcomputer, an EGA display, a hard disc, and a Hyundai HDP-920 printer. A COM1 port is used to connect the PC to the modem. The operating procedure of the system is outlined in detail. An example of a log reflecting the electric power consumption is cited. Figures 3; tables 1; references 7.

**Higher Electric Network Harmonic Analysis Allowing for Resistance**

927K0341D Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 23-24

[Article by I.V. Zhezhelenko, Yu.L. Sayenko, Mariupol Metallurgical Institute; UDC 621.311.1.011.2: 621.316.1.018.3.001.24]

[Abstract] The difficulty of correctly taking into account the electric network element resistance, i.e., its amplitude-frequency response, in upper harmonic analysis necessitated the development of a sufficiently simple method of assessing the electric network resistance. To this end, numerous analyses of the amplitude-frequency response of the resistance and reactance of electric networks of varying complexity and configuration are performed and the amplitude-frequency response of the electric network's input resistance is plotted and an equivalent circuit of the network with a parallel circuit resonance is cited. A formula is derived for calculating the electric network resistance under a current resonance; it can be used for the harmonics which differ from

the resonance harmonic by 5 percent and leads to an error of no more than 10-15

. The method can be used for analyzing 6-10 kV electric networks with a high  $Q$ -factor in order to improve the quality of electric power. Figures 2; references 2.

#### **Reactive Power Compensator Thyristor Key Control System**

927K0341E Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 36-37

[Article by S.N. Yedemskiy, V.A. Matigorov, S.V. Makarin, Northern Mechanical Engineering College, Severodvinsk; UDC 621.316.728:621.365.016.25]

[Abstract] The need to shorten the control pulse duration in reactive power compensating systems based on capacitor banks switched by thyristor keys (TK) and to ensure the thyristor key reliability under nonharmonic power network currents and voltages prompted the development of a control pulse generating system. The control principle is based on a modified method of shaping the thyristor control pulses: upon receiving a command to switch on the capacitor bank, the device first generates the first 100-110° pulse which controls each thyristor while all subsequent pulses are much shorter—3 to 5°. The control system is intended for connecting several capacitor bank sections to the power supply network using parallel-opposite thyristors in each section phase. A circuit diagram of the thyristor key control system is cited and timing charts of the thyristor key control pulse generation is plotted. The proposed device improves the thyristor control performance while protecting the reactive power compensators from switching failures under current and voltage distortions. Figures 2; references 3.

#### **On Principles of Developing National Standards of Electric Safety for Limits of Permissible Fibrillation Voltage and Current. Discussion**

927K0341F Moscow PROMYSHLENNAYA  
ENERGETIKA in Russian No 4, Apr 92 pp 38-40

[Article by V.I. Grave, Central Scientific Research Institute of Marine Electrical Engineering and Technology, St. Petersburg; UDC 621.311.1-784.37.001.2(083.75)]

[Abstract] National standards covering the limit of fibrillation current and voltage adopted in 1983 and revised in 1988 are discussed and it is noted that the factors which affect the danger of electric shock to humans, e.g., the resistance of the current path in the body, contact resistance of the soil and footwear, the network phase capacity relative to the ground, etc., have not been fully taken into account. It is recommended that these and other factors be incorporated in new standards and that primary electric safety criteria, i.e., shock duration and permissible current values, not be regulated by national standards since they do not reflect the actual electric safety. The allowable current and voltage through the human body should be derived allowing for the most

vulnerable T-phase of the heart cycle while shock durations of less than 0.01 s should be reevaluated for the case where the current coincides with the T-phase. Figures 1; tables 1; references 9: 8 Russian, 1 Western.

#### **Controlling Electromechanical Transients by Manipulating Impedance of Power Transmission System's Post-Emergency Operation**

927K0340A Minsk IZVESTIYA VYSSHIKH  
UCHEBNYKH ZAVEDENIY: ENERGETIKA  
in Russian No 5-6, May-Jun 92 pp 5-7

[Article by G.Ye. Pospelov, Belarussian State Polytechnic Academy; UDC 621.211.1]

[Abstract] A transition from one steady-state operation to another after an emergency or other deviation from normal conditions calls for changing the power transmission system capacity according to the dynamic and static system stability conditions for post-emergency operation. A study of the stability conditions makes it possible to find the maximum divergence angle  $\delta$  between the electromotive force (EDS) of the transmitting power station generators and the pickup bus voltage and thence, the dynamically stable transmitted power  $p$ . The dependence of the power  $p$  on the equivalent transmission system reactance is derived and it is shown that the simplest way of lowering the post-emergency reactance is by changing the phase shift or by using longitudinal compensation with the help of lumped compensators and uniformly distributed parameters of the transmission line itself. An analysis shows that longitudinal compensation makes it possible to decrease the equivalent reactance to much less than unity and is therefore an efficient means of controlling the post-emergency electromechanical processes in power transmission lines. Tables 1; references 3.

#### **Lowering Power Consumption at Power-Intensive Industrial Enterprise at Power System Peaks by Optimizing Voltage Conditions**

927K0340B Minsk IZVESTIYA VYSSHIKH  
UCHEBNYKH ZAVEDENIY: ENERGETIKA  
in Russian No 5-6, May-Jun 92 pp 8-12

[Article by V.S. Kakhanovich (deceased), O.I. Aleksandrov, A.A. Gonchar, G.P. Sbrodov, O.P. Korolev, Belarussian State Polytechnic Academy; UDC 658.26:621.31.027.07]

[Abstract] The technical policy of the past 15-20 years forced many industrial enterprises (PP) to operate under the conditions of an acute power shortage and even to disconnect their power users from the grid at peak load hours with attendant negative ramifications. Optimization of the voltage conditions in the plant distribution network is shown to be suitable for lowering the industrial enterprise load peak. Consequently, the correlation

between the voltage and load conditions which is determined by the static load characteristic (SKhN) is examined; to this end, the static load characteristic is derived in an active or passive experiment with the help of the corresponding instruments. The static problem is formulated and incorporated in a nonlinear programming model, then the resulting problem is considered and solved in a dynamic formulation. The method is illustrated by the examples of the Azot Production Association where a 3-5 percent voltage decrease at peak hours made it possible to lower the lighting fixture power consumption by 265.5 kW and induction motor power consumption by 1,551.55 kW and save 911,000 rubles a year (in Jan 92 figures), i.e., a gain of 0.5-1.2 percent of the enterprise's installed capacity. Tables 1; references 10.

#### **Possibility of Lowering Electric Machine Power Losses**

927K0340C Minsk IZVESTIYA VYSSHIKH  
UCHEBNYKH ZAVEDENIY: ENERGETIKA  
in Russian No 5-6, May-Jun 92 pp 16-20

[Article by N.F. Kotelenets, S.A. Semikin, Moscow Energy Institute; UDC 621.313.018.764.001.2]

[Abstract] The high rate of physical and energy resource consumption in electrical engineering brought renewed attention to the problem of further improving the technical and economic indicators of electric generators and motors, especially power losses during the recurrent consumption cycles, and prompted a study into the possibility of lowering the power losses by taking the electric machine's load curve into account at the design stage. Formulae are derived for calculating the power losses and three types of assumptions which must be made for this purpose are considered. The loss scale factor, load curves, and the 24-hour squirrel cage induction motor (AD) load curve are plotted. The findings reveal that the assumption of a constant rated motor efficiency (KPD) is not suitable for calculating the minimum loss per cycle; rather, the constant peak efficiency assumption must be used. If the loss is assumed to be constant, efficiency peaks at a mean load; on the other hand, if the new rated efficiency is less than the standard value, the loss can be calculated with the help of the scale factor. For example, for a squirrel cage induction motor, annual equivalent fuel savings from reduced losses may reach 73.8 kg or 4.8 kg/kW per year. Figures 3; tables 2; references 5.

#### **On Determining Power Switch Opening Angles of Self-Excited Voltage Inverter Under Microprocessor Control**

927K0340D Minsk IZVESTIYA VYSSHIKH  
UCHEBNYKH ZAVEDENIY: ENERGETIKA  
in Russian No 5-6, May-Jun 92 pp 21-23

[Article by S.N. Pavlovich, B.I. Firago, Belarussian State Polytechnic Academy; UDC 621.314.6]

[Abstract] The use of pulse-duration modulated (ShIM) self-excited voltage inverters (AIN) with thyristor or transistor switches in their power circuits is discussed and methods of determining the opening angle of the power keys in order to realize a sine-sawtooth PDM law are considered. A trend toward microprocessor-controlled systems prompted a study of the specific features of inverter operation under such conditions. To this end, transcendental equations are derived and solved for determining the opening angles of self-excited voltage inverters with sine-sawtooth PDM law. Yet the slow response speed of the microprocessors necessitated a new type of PDM; a comparison of both PDM laws reveals that for microprocessor PDM realization in a self-excited voltage inverter, power key control angles should be computed by the new formulae since the harmonic composition of the output voltage curve of the inverter, its integral coefficients, and additional induction motor losses due to the nonharmonic power voltage are almost identical to those of sine-sawtooth PDM realized by purely mechanical means. Figures 1; tables 1; references 3.

#### **Direct Current Motor Development Status and Outlook**

927K0339A Moscow ELEKTROTEKHNIKA in Russian  
No 3, Mar 92 pp 2-5

[Article by V.M. Minichev, G.N. Ulyanov, V.V. Fetisov; UDC 621.313.024.001.8]

[Abstract] The status and development outlook of direct current motors (MPT) manufactured by the Elektrosila Association—a leading DC motor maker in the CIS—are assessed and the power, voltage, rotation speed, torque, and dynamic moment of reversible and nonreversible DC motors manufactured by the association are summarized and a coefficient characterizing the technical level of motors is introduced. An analysis of the tables demonstrates that the power, torque, and technical level of large DC motors can be increased further. Recent developments in the field of large DC motor design and production are discussed and attention is focused on the electric motors developed specifically for escalators and drilling rigs, main propulsion motors, and heavy-duty 4P motors used in extractive industries. The technical level of today's DC motors and ways of raising it are outlined and multipass loop armature windings whose design determines the electric motor's limit of power is examined. Suggestions are made for calculating the electromagnetic fields, electromotive force, and insertion loss in the armature winding and improving the commutation analysis methods. It is speculated that in the near future, large motors with an 18-20 MW unit power and an electromagnetic torque of up to 40 MN x m will be developed. The conclusion is drawn that available scientific and practical experience will enable the association to meet the demand of any client, foreign or domestic. Figures 4; tables 4.



### Active Power Factor Correction of Converters With Single-Phase Input Rectifier

927K0339B Moscow ELEKTROTEKHNIKA in Russian No 3, Mar 92 pp 28-32

[Article by S.N. Florentsev]

[Abstract] The issue of electromagnetic compatibility (EMC) of the power supply network and converters in power electronics, especially in the case of switch-mode power supplies (KIVEP) with a nontransforming input rectifier and a capacitive filter in the direct current bus, is addressed and the low power factor (0.5-0.7) and high harmonic level (>30 percent) of these devices which limit the maximum power picked up from the mains are discussed. An analysis of foreign practices and standards indicates that actively shaping a harmonic (sine-shaped) consumption current on the switch-mode power supply input which is in phase with the power supply voltage or, in other words, using a transparent converter, is the best solution ensuring the switch-mode power supply's electromagnetic compatibility with the power mains. Various forms of active power factor correction (KKM) by means of shaping an input sine-current in phase with the power mains voltage on the input of a nontransforming diode rectifier with a capacitive filter are analyzed and current and voltage oscillograms on the switch-mode power supply input are plotted. A circuit diagram of a DC-to-DC step-up converter used for the power factor correction is cited and its operating principle is explained in detail. The integrated circuits which are currently manufactured abroad and perform the power factor correction and output voltage regulation functions are reviewed. It is noted that chopper DC-to-DC converters are inefficient for these purposes. Figures 7; tables 1.

### Insulating Materials for High Heat Resistant Electrical Equipment

927K0339C Moscow ELEKTROTEKHNIKA in Russian No 3, Mar 92 pp 41-44

[Article by E.Z. Asnovich; UDC 621.315.612/613-619.001.5]

[Abstract] The emergence of electric machines and equipment which are highly heat resistant and are capable of operating under severe or even extreme conditions prompted the development and application of new electric insulating materials (EIM) and insulation systems (SI) which ensure reliable operation of electrical equipment at temperatures of 250-600°C for several thousand hours. The shortcomings of such traditional insulating materials as ceramics, mica, and glass due to the impossibility of molding them into tapes and sheets are discussed and the outcome of extended research carried out in the USSR for many years is presented. These studies led to the development of a range of sheet, tape, impregnating, coating, encapsulating, and other insulating materials which make it possible to produce insulation systems which meet the most stringent

requirements. For example, an insulating system consisting of a copper conductor with a glass fiber insulation impregnated and glued with an organosilicon compound is developed for a 250°C temperature while another material consisting of an alloy 204 conductor protected by an electroplated Fe and Ni coat with a quartz filament insulation glued and impregnated with a suspension of refractory oxides and silicates in a polyorganosiloxane lacquer is developed for a 600°C. These and other insulation systems are tested and display excellent service properties. The principal property indicators of high heat resistant insulating materials and insulation resistance and breakdown voltage are summarized and the dependence of the insulation resistance on the number and duration of aging cycles at various temperatures and the dependence of the insulation breakdown voltage on the number and duration of aging cycles at various temperatures are plotted. The new materials make it possible to develop diverse electrical devices for various industries and are being currently produced in commercial quantities. Figures 2; tables 2; references 4.

### New Developments in Metal-Clad Materials Field

927K0339D Moscow ELEKTROTEKHNIKA in Russian No 3, Mar 92 pp 44-47

[Article by V.I. Zaytsev, A.V. Tarasov, L.N. Borisova, S.N. Kostriiski; UDC 621.315.61:669-416]

[Abstract] Recent developments in the field of multilayer printed boards (MMP) used in electronic devices and the increasingly stringent requirements being imposed on the properties of metal-clad materials prompted a review of the most important advances in metal-clad materials and technologies achieved in the past three years at the All-Union Scientific Research Institute of Electronic Machines (VNIIEM). After examining epoxy compositions on the basis of various epoxy oligomers, aromatic amines, and imidazol and chelate hardening accelerators, the institute developed foil-plated materials whose properties exceed those of commercially produced materials. The basic characteristics of metal-clad multilayer printed board materials with epoxy and bismaleimide binders, the effect of the heating temperature on the adhesive properties of metal-clad epoxy materials, and the effect of the heat treatment temperature and duration on the properties of the SFVN metal-clad material are summarized. An alignment chart for selecting the optimum two-stage extrusion parameters is plotted: it shows the dependence of pressure at the second extrusion state on its application time and the pressure at the first stage. An analysis of test data on the new materials made it possible to develop recommendations for making metal-clad materials with a <0.03 percent linear dimension stability and a <1 mm warping on a 300 mm base. Figures 1; tables 3; references 5: 3 Russian, 2 Western.



**Design Process Development Characteristics of Small Machine for Producing UNK Superconducting Transposed Wire**

927K0339E Moscow ELEKTROTEKHNIKA in Russian No 3, Mar 92 pp 51-56

[Article by Ye.R. Borisov, A.N. Surkov; UDC 621.315.2/3.002.5.621.315.31.001.6]

[Abstract] The need for batch production of superconducting transposed wires for the high energy physics applications necessitated the development of a special new twisting-transposing cabling machine since old equipment does not meet today's standards. The resulting MKT-28 machine developed at the High Energy Physics Institute (IFVE) is described and the methods of producing various types of superconducting transposed wires (STP) are illustrated. The design and process characteristics of the small-scale transposing cabling machine development are discussed and the effect of the transposition method on the level of residual tangential stresses in the superconducting wires (SSP) is summarized. A schematic diagram and block diagram of the NKT-28 machine stand are cited and the machine's design and specifications are presented. Two machines began pilot operation in 1990 and produced 42.5 km of 19 x 0.85 and 13 x 0.85 transposed superconducting wires. Three similar machines are being made at the institute. The results of the machine performance are analyzed; the superconducting transposed wires produced in them have an accuracy of within 3  $\mu\text{m}$  vs. a 5  $\mu\text{m}$  tolerance. The test results confirm the expediency of commercial production of transposing cabling machines for superconducting dipoles and quadrupoles. Figures 4; tables 2; references 6: 3 Russian, 3 Western.

**Voltage Recovery Processes on Generating Station Circuit Breaker Contacts of Pumped Storage Hydroelectric Power Plants**

927K0339F Moscow ELEKTROTEKHNIKA in Russian No 3, Mar 92 pp 59-63

[Article by K.P. Kadomskaya, A.I. Loksh, A.A. Tikhonov; UDC 621.316.542.621.3.066.6.001.5]

[Abstract] The advantages of generating station circuit breakers in hydroelectric pumped storage power plants (GAES) and the principal processes which determine the switching ability of circuit breakers, primarily voltage recovery in the arc control devices (DU) are discussed. An attempt is made to summarize the principal characteristics of the recovering voltage on the contacts of pumped storage hydroelectric plant generating station circuit breakers within a broad range of generating unit capacity and examine the characteristic features of the voltage recovery process in the arc control device during the disconnection of no-load transformers. The principal characteristics of recovering voltages are considered and the currents switched by the generating station circuit breakers are summarized. Proper recovering circuit breaker contact voltages are plotted and the recovering voltage characteristics of the first quenching pole of the generating station circuit breaker are examined. An analysis of the recovering voltage behavior reveals that during the disconnection of the load currents and faults, it has a two-frequency oscillatory character while the recovering voltage peaks when the circuit breaker disconnects an induction motor. When disconnecting no-load transformers, high voltage peak ratios occur in the case of vacuum chamber arc control systems. Figures 6; tables 2; references 4.

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